Products finishing

FRED W. VOGEL, Editor

Volume 4 • AUGUST, 1940 Number 11

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PRODUCTS finishing

CINCINNATI, OHIO VOL. 4, NO. 11

AUGUST, 1940

By FRED W. VOGEL

RECOGNITION of the fact that the economical and profitable operation of any manufacturing firm is largely dependent upon the careful supervision of all operations has enabled many firms to successfully meet competition. Of all the more common methods of providing adequate supervision, perhaps the most effective method is to be found in a carefully directed program of research coupled with process control. Among the leading manufacturing organizations where the value of re-

search programs in both fabricating and finishing departments has been tested and proved is Crane Co., Chicago, Illinois.

The field of Crane manufacture covers valves, fittings, and fabricated piping and accessories in a variety of sizes, shapes and materials for controlling and conveying fluids and gases in both domestic and industrial applications, transportation equipment, and processing industries. Products for domestic use include plumbing and heating equipment and accessories. In the Crane foundries, tons of raw materials are turned into thousands of valves, fittings, and other products of iron, steel, and brass to a total tonnage, each year, of approximately 125,000 tons. A well equipped brass foundry is provided for the casting of the brass, bronze, nickel and other alloyed non-ferrous metals that go into the making of the valves and fittings and plumbers finished brass which are part of the complete Crane line.

Carefully supervised research program for finishing departments is important factor in success of Crane Company.

From the foundry and cleaning room these products go to the machine shop to be drilled, threaded, turned, faced, and to receive whatever other fabricating operations are necessary before they are transferred to the various finishing departments. A variety of finishes is required for the diversified products which comprise the Crane line. Most of these are essentially protective and all are more or less decorative. Several are applied by the electroplating process.

Through its careful plating supervision this company has paved the way for efficient finishing practice by insuring the use of properly designed work racks for plating, filtering equipment for plating solutions, the reduction of dragout of expensive plating and

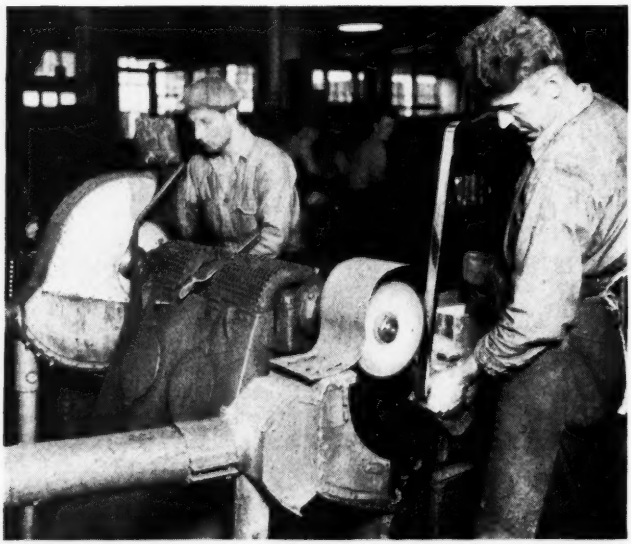


Fig. 1 — Polishing a U-shaped modernistic lavatory stand prior to plating.

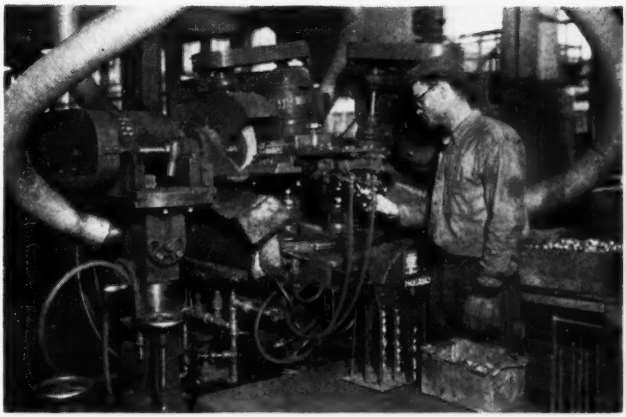


Fig. 2—An automatic polishing machine designed for the production polishing of small parts.

•

cleaning solutions, positive electrical connections, adequate fume ventilation of solutions and hot water rinses, proper location of equipment to facilitate handling of work, tack ragging work before finishing, and many other improvements. Crane products for household as well as industrial use are visible while in service and, therefore, require finishes that are attractive and at the same time permanent.

Throughout the manufacturing and finishing departments, extreme caution is taken in order to keep handling marks to a minimum. In the polishing department the operators of the pedestal type polishing and buffing units insert paper separators between pieces of work to protect against scuffing from contact with other pieces. Many large and intricately shaped pieces which cannot be readily adapted to automatic polishing are polished and buffed by hand as shown in the illustration, Fig. 1. The polishing and buffing department contains rows of polishing and buffing lathes of the double spindle type which are located at convenient intervals and with plenty of working space around them, thus enabling the work to be moved smoothly and without interruption. The workman shown in the illustration, Fig. 1, can be seen polishing a U-shaped modernistic lavatory supporting stand as part of the preparation for plating.

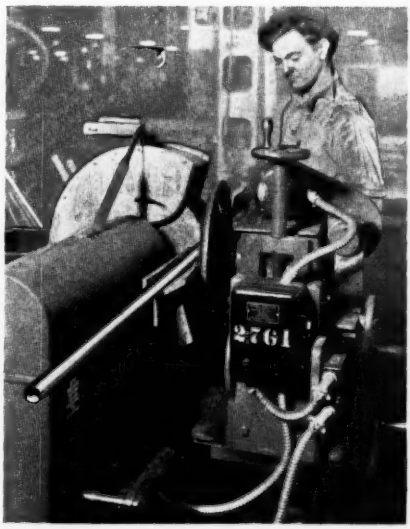


Fig. 3—Illustration showing the polishing of round stock. The operator starts the work into the unit and a leather-faced wheel forces it past a polishing wheel.

Twenty-five pounds of brass are used in the casting of certain plumbing fixture parts. Surface irregularities are removed during the roughing operation by polishing with a No. 60 Turkish emery abrasive grain set up on a sewed canvas wheel and oper-

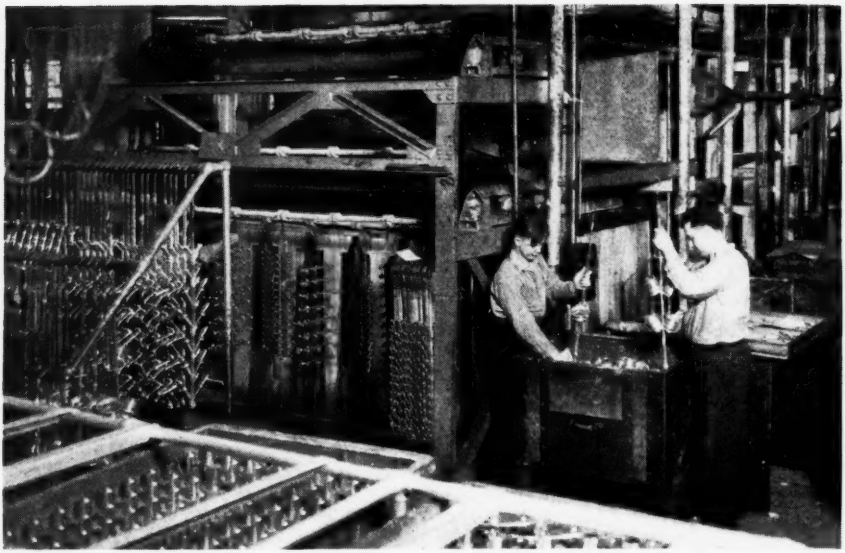


Fig. 4—A view of an automatic plating unit, showing the loading end.

ated at about 2,500 r.p.m. The second polishing operation is performed on a similar wheel set up with a finer grade of emery. For various jobs eight grades of emery of different grain size from 50 to 200 are used. Besides canvas wheels, felt and sheep skin wheels are used for certain polishing operations.

An automatic machine designed for the production polishing and buffing of many small parts such as flanges, shower nozzles, packing and trap nuts, and so on, is shown in Fig. 2. High quality production work is obtained from this three-wheel, Model No. 1A, eight-station type

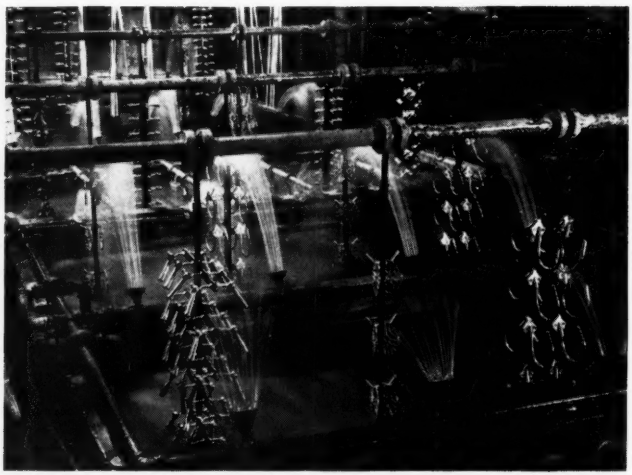
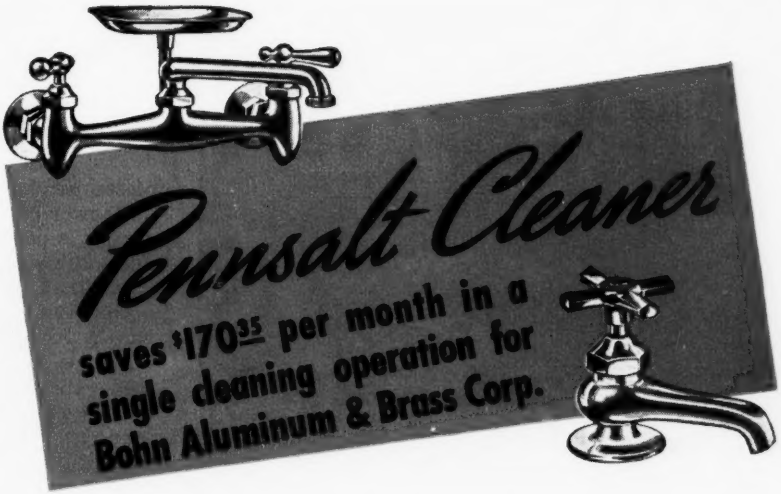


Fig. 5 — Sprayjets over the rinse tanks of the automatic plating unit are so positioned that the work is flooded with water continuously.



THE Capitol Brass Works Division of Bohn Aluminum & Brass Corp. makes the kind of plumbers' brass goods that helps to bring chrome-plated beauty to modern kitchens and bathrooms. The metal cleaning operation prior to plating involves some special problems, one of which is the removal of the buffing compound used to polish the brass castings.

Too strong a metal cleaner could discolor the brass, yet ordinary cleaners were not effective. But one of the Pennsalt Cleaners was found to be completely effective, safe, and ...exceedingly economical. By saving time and materials, it saves an average of $170.35 per month in the cost of a single metal cleaning operation.

This is but one example of what the Pennsalt Cleaners are doing for many industries. They have won their place in each plant by doing a better job at lower cost. For heavy-duty operations there is Orthosil, the original product in this line. For varied and extreme requirements there is a series of other Pennsalt Cleaners that meet every need with laboratory precision.

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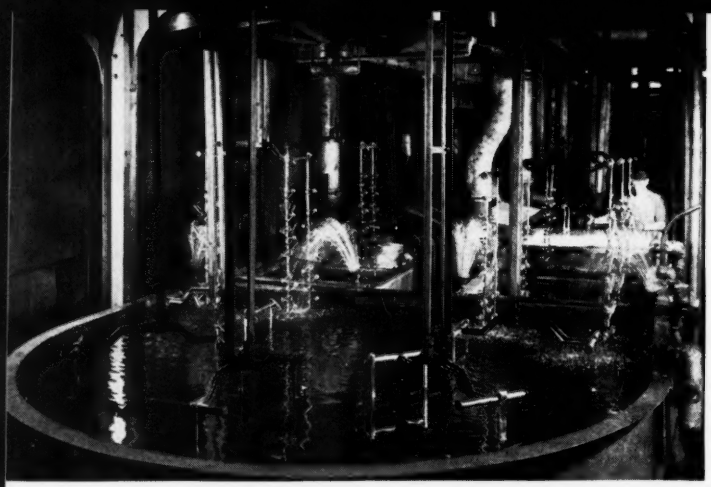

Fig. 6— Return type automatic unit for chromium plating.

polishing machine which is manufactured by The Packer Machine Co. The workpieces are placed on spindles on holding fixtures located on the circular table which revolves beneath the polishing wheels. As shown in this illustration each wheel is equipped with an individual exhaust tube which is designed to remove all dust at the point of origin. Standard production of small parts on this machine ranges between 500 and 600 pieces per hour.

Shower curtain tubing is polished automatically on pedestal type units like that shown in Fig. 3. The operator feeds the tubing between the polishing wheel and a powered leather-faced wheel. The revolving action of the leather-faced wheel forces the tubing past the polishing wheel and at the same time applies sufficient pressure to insure complete polishing. Known as the Acme Type "T1" single station polishing machine, this unit will finish 1,000 ft. of tubing per day with a "ready to plate" surface. The utmost precaution is taken when parts are transferred

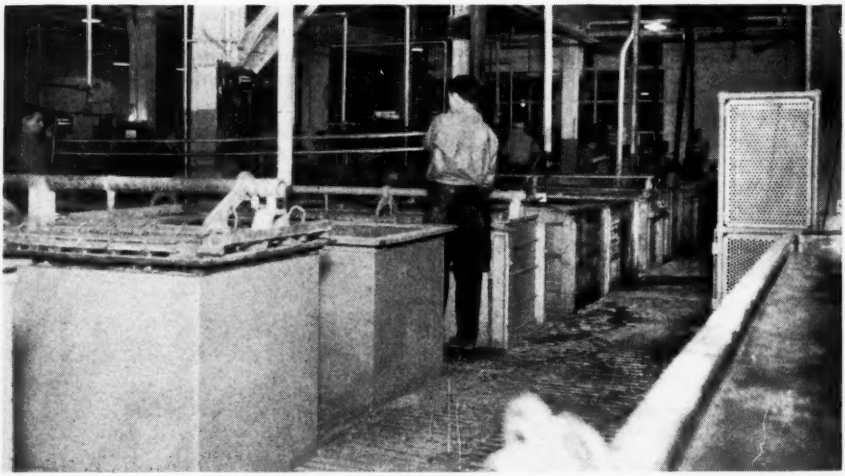

Fig. 7—Long bars and rods are plated in special built tanks which are located in the department shown in this illustration.

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And there is gold — big weekly savings—in pre-cleaning metal with a WYANDOTTE solution.

For example: A plant cleaning fabricated steel prior to painting reduced cost of initial tank charge more than $10.00, and the total cost of operation for a week dropped from $32.00 to less than $9.00!

Because cleaning methods and kind of work vary, WYANDOTTE cannot guarantee such savings on *every* metal pre-cleaning job, but there are many jobs where pre-cleaning with a WYANDOTTE solution will save you real money.

HERE ARE THE DETAILS:

FORMER COSTS		WYANDOTTE COSTS	
Cost to charge tank*	$12.00	Cost to charge tank	$1.22
Mon. *(Replenishing solution)*	4.00	Mon. *(Replenishing solution)*	1.51
Tue. *(Replenishing solution)*	4.00	Tue. *(Replenishing solution)*	1.51
Wed. *(Replenishing solution)*	4.00	Wed. *(Replenishing solution)*	1.51
Thur. *(Replenishing solution)*	4.00	Thur. *(Replenishing solution)*	1.51
Fri. *(Replenishing solution)*	4.00	Fri. *(Replenishing solution)*	1.51
TOTAL cost for week	$32.00	TOTAL cost for week	$8.77

**It was necessary to dump the tank at the end of each week*

• The low cost for charge and up-keep with the Wyandotte Solvent Detergent permits dumping the solution at any time to allow recovery of parts dropped in the tank during the day's cleaning.

Wyandotte

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from the polishing department to the plating department in order to prevent damaging the parts in any manner that might show up after the work has been plated.

The major portion of the small parts, together with the lavatory stand and other large pieces, are plated by means of the full automatic plating equipment shown in illustration Fig. 4. This equipment consists essentially of a series of tanks located adjacent to each other and served by an overhead conveyor system which carries the racked workpieces into and out of the various cleaners, rinses, and plating solutions.

Workpieces for the automatic plating unit are racked by the workmen shown in the foreground of the illustration, and the racks are then hung on the cross-bars of the conveyor. As the conveyor rods move upward and into the first section of the unit, a spray washer is automatically turned on and the work is forcibly flushed with an alkaline cleaning solution. An alkaline cleaner in which the parts are immersed for a short time interval follows the spray, thus assuring complete coverage by the cleaning solution of the corners and recesses in the work. The conveyor next carries the racked work into an alkaline electro-cleaning solution in which direct current is passed through the solution for two minutes in one direction and then reversed for twenty seconds. Two cold water rinses follow — one spray rinse and the other in a still tank.

An interesting feature of the method of spray rinsing is illustrated in Fig. 5. As shown, sprayjets are so positioned that the work is flooded with water continuously, thus keeping the workpieces wet as they pass

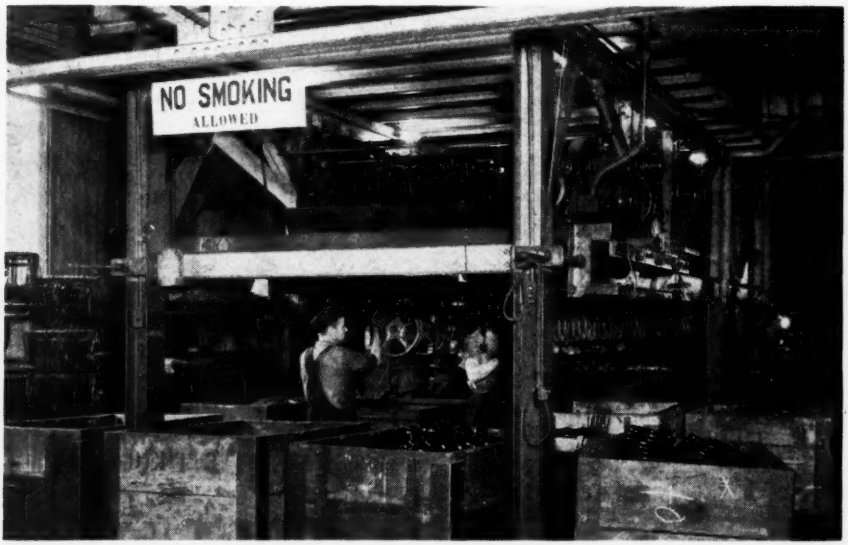

Fig. 8—A view of the japanning department is shown here. The workpieces are dipped into the finishing material tanks located in the foreground and then hung on the horizontal bars of the oven conveyor.

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from one tank to the next. Spray rinsing by this method eliminates the water marks that frequently appear on the surface of metal workpieces when water or solution is permitted to stand on the surface for any length of time. In addition, complete and thorough rinsing of the work is definitely assured by this spray method of rinsing.

Crane Chromium Plated Faucet

A sodium cyanide solution consisting of a 2½ to 3 ounces per gallon of water follows the still tank rinse. After another rinse the parts are ready for the copper strike. The temperature of the copper strike solution is maintained at 120 deg. F. Immersion time is relatively short and calculated never to exceed one-half minute. Two cold water rinses are next employed to remove all excess copper solution after the copper strike. Immersion in the nickel plating tank which contains 12,500 gallons of nickel solution follows. This bath is made up as a standard nickel bath according to the following formula:

Single nickel salts,
25 to 35 oz. per gal.

Nickel chloride,
6 to 8 oz. per gal.

Boric acid,
5 to 8 oz. per gal.

Although the temperature of this bath is not critical it is maintained at 110 deg. F. with an automatic temperature controller. Periodic pH determinations made with a Thwing-

Fig. 9—Parts to be galvanized are pickled in the acid pickling tanks which are located in the department shown in this illustration.

THE HELPING HAND

DeVilbiss Serves American Industry

● DeVilbiss has made possible new standards of finishing for American industry. To the casual observer this alone seems important enough, in an age when color and decoration affect the sale of so many products, from saxophones to gangplows, from toys to motor cars, from hairpins to refrigerators.

But the total contribution made by DeVilbiss is much more far-reaching.

DeVilbiss Spray Systems have speeded up finishing processes to the pace of modern manufacturing operations, and eliminated what was once considered the "bottle-neck" of production. They have transformed the finishing department into a model of orderliness, sanitation and safety. They have increased the productivity and earning power of labor, and bettered working conditions. They have brought about economies in time and materials to be passed on in lower selling prices, for the development of wider markets.

DeVilbiss is proud of its position as a "helping hand" to American industry. Wherever any coating or finishing process is employed, DeVilbiss Spray Systems offer willing assistance to improve quality of products, efficiency of operations, and volume of business.

THE DEVILBISS COMPANY • TOLEDO, OHIO

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DEVILBISS SPRAY SYSTEMS

Albert portable pH meter enable the plater to keep a careful check on the balance of the plating bath. The plating bath as just described operates most efficiently at a pH of 5.2. The current density ranges between 9 and 12 amperes per square foot with voltages ranging between 2 and 3. Thickness specifications for the nickel coating receive special attention; therefore, the work is required to remain in the nickel plating bath for thirty minutes or until a deposit of .0002 in. thickness has been obtained. A cold water rinse follows the nickel plating bath — then a hot water rinse, which leaves the work warm and dry.

At the end of the plating sequence in the automatic plating unit an operator unracks the workpieces, packs them into tote boxes and conveys them to the buffing department. Here, careful color buffing assures a satisfactory base upon which a brilliant chromium finish can be obtained. Fig. 6 shows a view in the chromium plating department. An overhead monorail conveyor located directly above the plating tanks carries the racks of work from tank to tank.

Many long workpieces such as 12 ft. sections of brass pipe are plated in special built tanks located in the nickel plating department, a view of which is shown in Fig. 7. Immersion in an alkaline cleaning solution with reversed current removes smut, grease and oil, leaving the work clean. This is followed by a cold water rinse in a still tank which removes any excess alkali that might have been picked up in the cleaning solution.

A dip in a ten per cent solution of sulfuric acid is followed by another cold water rinse which leaves the parts ready for nickel plating. This nickel solution is made up with 3 oz. of single nickel salts, ½ oz. nickel chloride, and 4 oz. boric acid per gallon. Best results are obtained from

Fig. 10—A view of the kettles containing the molten zinc for the galvanizing operation.

3 "MICCRO" PRODUCTS

That Answer YOUR Requirements For Effective Protective Coatings

MICCRO SUPREME STOP-OFF LACQUERS—For insulating plating racks for decorative plating and for masking parts to be hard chromium plated. They possess protective qualities which eliminate reracking any work which is carried through degreasing, washing and the complete plating cycle. Used as a rack coating, the cost of application per rack is almost negligible. Racks damaged in process can be touched up immediately. For masking parts for hard chromium plating, these lacquers assure extremely accurate plating work, and with no possibility of etching in precision lapped or super-finished parts.

MICCROLITE—A coating material that meets every protective requirement for plating racks used for any purpose. It not only offers all of the qualities of Miccro Supreme Stop-Off Lacquers, but can be applied faster and will dry in less time. Dipping speed is approximately five times that of other coatings. Because of its fast air-drying qualities, racks can receive the necessary seven coats in one day and be used the next. While slightly higher in price than the Stop-Off Lacquers, it offers exceptional economy in use.

. . . **AND THE NEW MICCROLAC**—A protective coating, water-white in color, that protects and beautifies the surfaces of silver-plated ornaments, etc. . . . polished brass or brass-plated light fixtures, interior or exterior hardware, and similar products . . . cadmium plated surfaces . . . automobile hardware . . . copper, aluminum, wrought iron or stainless steel surfaces . . . and almost all other natural metal or plated finishes. It offers qualities of high lustre, excellent adhesion, flexibility and abrasion resistance. It dries exceptionally fast. Sulphur dioxide, sunlight, moisture, oil, grease, gasoline and chemical fumes do not affect it, and it does not blush even in the most humid weather. It comes ready for use, requiring no thinner.

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this solution when it is operated at a pH of 5.1 as determined by the electrometric method. Satisfactory throwing power is obtained with the current at 10 to 15 amperes per square foot.

Many small parts and some others which are difficult to buff are bright nickel plated in an automatic plating tank.

In another department of the Crane plant, valve handwheels, fittings, and so on are coated with japan finishes in one of four colors and then baked. The equipment in this department includes a 365-gallon dipping tank and an electrically heated baking oven. Fig. 8 shows a view of the loading end of the japanning oven. The capacity of this oven has been estimated to be approximately 12 tons of work per day or a maximum of 1,000 average size workpieces every three and one-half hours.

Crane Chromium Plated Purflo Bubbler

Two colors of japan are used in the finishing of valve handwheels—black for iron and steel valves, and maroon for brass valves. The workmen shown in the illustration dip the work into the japan finish and then place it on the longitudinal bars of the oven conveyor. The oven is 20 ft. long by 25 ft. high and is separated into two compartments. For the black finish the temperature is maintained at 375 degrees in the first compartment and 425 degrees in the second compartment. The conveyor on which the work is carried through the oven is equipped with 67 horizontal work-carrying bars which are located on 2-ft. centers. A Leeds & Northrup temperature controlling instrument with which the oven is equipped holds the temperature within one degree of the desired temperature.

The maroon finish requires approximately five hours for thorough baking; thus, the work is placed in the first compartment or the pre-heat section of the oven which is maintained at 300 deg. F. and then passed into the second compartment where the temperature is kept constantly at 350 deg. When the workpieces are removed from the conveyor they are ready to be transferred to the assembly department where complete assembly of the various units takes place.

Hot-dip galvanizing tons of pipe fittings and component parts is another important phase of finishing at the Crane plant. The production of the five kettles in the hot-dip galvanizing department averages approximately 12 tons per kettle per eight-hour day. As a preliminary operation to galvanizing the parts are pickled in the tanks located in the department which are shown in the illustration, Fig. 9. An overhead crane is provided for picking up crates of workpieces and lowering them into the pickling solution. The pickling operation is followed by a clear water rinse. After the rinse the fittings are lowered, in the crate, into a flux solution. Following a short period of immersion in the flux solution they are dumped from the crate into the hop-

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The Bonderized sheet comes from the mill ready for fabrication. No acid etching or special treatment for paint adhesion is necessary. Only normal preparation with organic cleaners is required. Any good standard paint system may be used.

The Bonderized-Galvanized Sheet is economical and efficient. Speeds up manufacturing operations. Assures a rust-free, fine appearing, long lived finish on the product.

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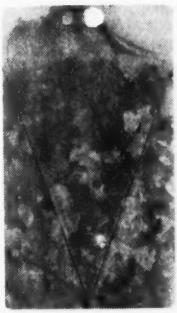

Figure No. 1. **A Galvanized section finished with two coats of paint. Exposed in Florida 18 months. Paint peeled from most of the surface.**

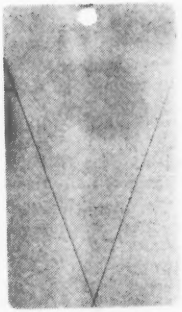

Figure No. 2. **A Galvanized and Bonderized section. Finished same as section No. 1. Exposed in Florida 18 months. Surface O.K. Adhesion good.**

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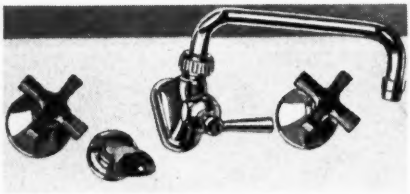
per of a continuous dryer where they are quickly dried by heated air. Parts too large for the continuous dryer are dried on gas heated hot plates.

The fluxed and dried fittings are lifted by the overhead traveling crane and dumped into hoppers at one end of each of the galvanizing kettles. From the hoppers they are fed into wire screen baskets in which they are galvanized by lowering into the molten zinc in the galvanizing kettle. When they become satisfactorily coated with zinc as judged by the skilled, experienced operators of the galvanizing kettles, they are lifted from the zinc bath, immediately sprinkled with sal ammoniac to flux off excess zinc, after which they are quickly quenched in hot water to set the zinc coating. See Fig. 10. From the hot water the fittings are loaded into boxes for transfer to the machine shops for tapping when required, or to storage or assembly sections if no machining is necessary.



Chromium plated supply fixture of modern Sunnyday Kitchen Sink.

Oakite Company No. 32 Booklet. Of special interest to superintendents, purchasing officials, and other administrative executives of machine shop departments and metal-working plants interested in safe, modern methods of removing hard water scale and rust deposits from water-cooled equipment, should be this 20-page, illustration booklet released by Oakite Products, Inc., 20 Thames St., New York, N. Y.

The booklet describes a recently developed material known as Oakite Compound No. 32 and tells how it makes possible the safe, effective descaling of Diesel and gas engine cooling systems, mechanical refrigerating equipment, condensers of various types, and numerous other types of water-cooled equipment. Helpful suggestions on removing rust from small metal parts and articles are also given.

Copy of booklet free upon request.

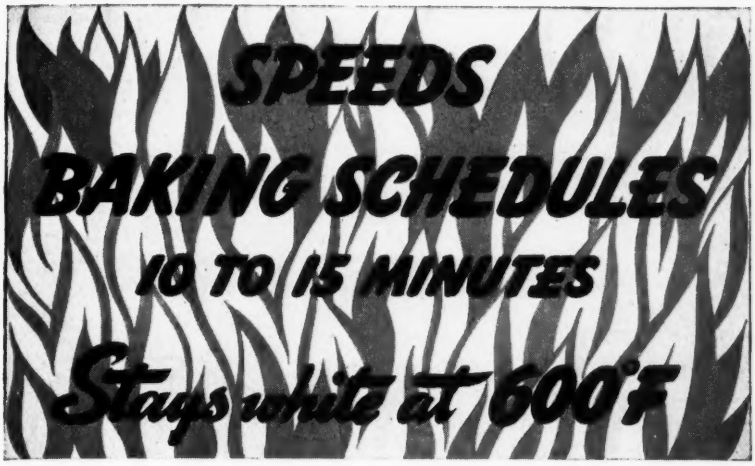
American Cyclone Dust Collector. Circular No. 32, which describes the new American high efficiency cyclone dust collector, is now being issued by The American Foundry Equipment Company, 580 S. Bykrit St., Mishawaka, Ind. The American cyclone dust collector is of the type generally known as the high efficiency, long cone cyclone, and is said to be distinctly different from the large diameter short cyclones. Due to careful proportioning of the unit, unusually high efficiencies are said to be obtained.

A copy of Circular No. 32 will be sent free upon request.

Guide to Nickel Alloys. A general guide to the uses and properties of nickel and high nickel alloys is incorporated in a new illustrated booklet which has just been published by The International Nickel Company, Inc., 67 Wall St., New York City.

In a 16-page, pocket size edition, this new publication "Seven Minutes With Seven Metals," includes material on Nickel, Monel, Inconel, and associated alloys in both mill and clad forms. Space is also devoted to the properties and uses of the metals in cast form. Altogether, there are three pages devoted to detailed tables on mechanical, chemical, and physical characteristics.

While prepared under technical supervision, the guide was edited for both technical and non-technical readers. Copy free upon request.



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METAL COLORING THEORY AND PRACTICE—PART 8

By JOSEPH B. KUSHNER, CH.E.
Electroplating Consultant

IN recent years, aluminum has become of great importance as far as the metal finisher and colorer are concerned. This silvery, light weight metal, as a constituent of a number of now commonly employed alloys, is finding more and more uses in the fabrication of metallic objects of all kinds. The finishing of these metallic objects imposes many problems on the metal colorer who is called upon to finish them.

Joseph B. Kushner

Aluminum is an extremely active metal. It is practically at the top of the electromotive series and combines chemically with almost anything in sight. It does not form any colored compounds to speak of, thus a colored finish on aluminum due to the formation of an aluminum compound on the surface of the aluminum is definitely out of the picture. There are only two possible ways of obtaining colored aluminum finishes. These are, (1) to precipitate other metals and their compounds on the aluminum by chemical or electrochemical means and (2) to make use of the absorptive properties of aluminum oxide.

Aluminum has always been a notoriously difficult metal to plate. It readily forms a non-conducting oxide layer, consisting of a Al_2O_3, at the drop of a hat. If this oxide layer is removed by treatment in powerful chemical reagents, the oxide is reformed almost before you can say Alumilite. As a result, anything that is deposited over it will not adhere.

Prior to the discovery by Travers of a very clever method of obtaining adherent deposits of other metals on aluminum (a method patented as the "Chrome-Alum Process" which actually makes use of the aluminum oxide layer as an anchorage for the electrodeposited metal, instead of the usual custom of destroying it), a typical procedure for plating another metal (zinc) on aluminum, was the following:

1. Clean work in a mild alkaline cleaner consisting of:

Sodium carbonate ..... 2 oz.

Trisodium phosphate .... 2 oz.
Water ..... 1 gal.

2. Rinse and dip in a pickle of 5 to 7 per cent hydrofluoric acid.

3. Rinse and plate in the following bath:

Zinc cyanide ..... 4 oz.
Sodium cyanide ..... 4 oz.
Ammonia ..... 4 oz.
Peptone .....⅛ oz.
Water ..... 1 gal.

Plate for 1 to 10 minutes at a current density of about 3 amps. per sq. ft. After the zinc has been deposited, copper can be plated on the zinc from a cyanide copper bath. From this point on the deposits can be colored in any desired way.

Iron Grey Color

It is possible to get an iron grey color on aluminum from a solution made up according to the following formula:

Potassium sulfide..... 3½ oz.
Vanadium sulfate..... 15/100 oz.
Water..... 1 gal.
Temperature..... 200 deg. F.

Rub the colored aluminum lightly with fine steel wool to relieve the highlights. Lacquer or finish with carnauba wax.

Antique Silver Color

A fairly good imitation of old silver can be obtained with a bath of the following composition:

Arsenous oxide .....10 oz.
Sodium carbonate
(anhydrous) .....10 oz.
Water ..... 1 gal.

This mixture should be used boiling hot.

Dull Grey

A dull grey finish can be obtained with the following bath:

Ammonium
metaphosphate..... 3 oz.
Sodium nitrate..... .5 oz.
Water..... 1 gal.
Temperature.....180 deg. F.

Another grey finish which resembles that of old silver or pewter and which is somewhat easier to highlight than the one given previously, because of lessened adherence, is the bath given below:

Ammonium chloride ..... 4 oz.
Nickel sulfate ..... 4 oz.
Ammonium nitrate ..... 1 oz.
Water ..... 1 gal.
Use hot.

Blue Color

A blue color resembling the blue obtained on brass by use of the luster wash (see previous article, number VI) can be obtained from a solution made up according to the following formula:

Iron chloride..... .75 oz.
Potassium ferricyanide.... .75 oz.
Water..... 1 gal.
Temperature.....150 deg.

The color here is not due to a true precipitation, but rather more to the absorption of the ferric ferricyanide (Trumbull's Blue) in the pores of the superficial oxide layer on the aluminum.

Blacks

A light black color can be had on aluminum by dipping the work in a concentrated alcoholic solution of cobalt salt and burning off. The black is due to the formation of an oxide of cobalt on the aluminum. A bath recommended for this purpose is a

10 per cent solution of sodium cobaltous oxide plus sufficient ammonia to almost redissolve completely the precipitate which first forms on the addition of the ammonia.

A poorly adherent black which may, however, serve some purposes by giving interesting antique effects is produced by the following solution:

Ferric chloride	5 oz.
Hydrochloric acid	½ fluid oz.
Water	1 gal.
Temperature	180 deg. F.

Another formula for an immersion black on aluminum is the following:

Nickel sulfate	1½ oz.
Sodium fluosilicate	½ oz.
Potassium nitrate	3 oz.
Water	1 gal.

A good black can be obtained by treating the work in a bath of:

Potassium permanganate	1 oz.
Nitric acid	16 cc.
Copper nitrate	3.5 oz.
Water	1 gal.

The use of ammonium molybdate solutions gives rise to an excellent black finish on aluminum. The formula given here is typical:

Ammonium molybdate	2 oz.
Ammonium chloride	4 oz.
Boric acid	1 oz.
Potassium nitrate	1 oz.
Water	1 gal.
Temperature	180 deg. F.

The finish should be lacquered or waxed.

Black nickel can be readily deposited on aluminum. A bath which has been recommended by the Aluminum Co. of America for producing a black finish on aluminum is the following:

Nickel ammonium sulfate	8 oz.
Zinc sulfate	1 oz.
Sodium sulfocyanite	2 oz.
Water	1 gal.

Use nickel anodes. Room temperature. 1 volt. 1 to 2 amps. per sq. ft. An important point is to keep the solution near the neutral point by the occasional addition of zinc carbonate.

Other Colors

Aluminum can be given yellow and brownish tones with some of the solutions listed below.

A rather fugitive yellow color:

Sodium bichromate	½ oz.
Hydrogen peroxide (30 per cent)	10 cc.
Ferric chloride	½ oz.
Water	1 gal.

Use the solution at room temperature.

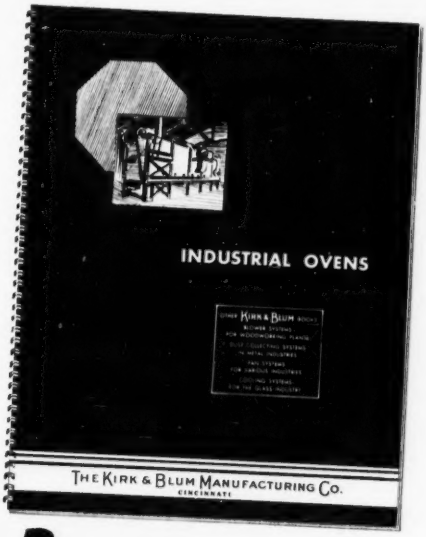
An imitation of bronze is produced with a solution which contains the following ingredients:

Potassium permanganate	3½ oz.
Copper sulfate	½ oz.
Water	1 gal.

Use the solution hot. Immerse work until desired shade is obtained.

Interference Oxide Colors

Not many years ago, considerable doubt was expressed in the idea that colors of certain metallic films could be due to light interference (this phenomenon was explained in detail in Part I of this series). In 1929 an English experimenter by the name of Bannister performed a series of experiments which gave definite proof that the color of certain metallic oxide films was due to interference and not absorption, as had been suspected. He produced extremely thin layers of aluminum oxide on metallic aluminum strips by anodic treatment of the test pieces in a saturated solution of di-sodium phosphate at 17



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deg. C. The reason this fact is mentioned here is that this investigator obtained an entire range of colored effects which may possibly be practical for commercial purposes. The writer has seen no other mention of these particular colors anywhere in the literature. According to Bannister, the following definitive results were obtained:

Anodic Voltage	Color
40 - 59 volts	pale yellow
59 - 69	brown
69 - 77	red
77 - 85	purple
85 - 93	blue
93 - 107	green
107 - 120	yellow

Increasing the voltage up to 239 volts produced two more complete orders of these colors. The cycle of these colors is similar to that of the typical interference spectrum. Further tests by Bannister indicated the following variation of the thickness of the aluminum oxide film with the color produced:

Thickness of Al_2O_3	Color Observed
.075	straw
.087	brown
.104	purple
.136	violet

The Oxide Absorption Finishes

In 1924 Bengough and Stuart took out the first patent on a method for protecting aluminum from corrosion by electro anodic treatment in a solution of chromic acid. The procedure was known long ago that films of aluminum oxide formed on aluminum by chemical or electrochemical treatment exerted a protective effect on the metal below but the films produced by the methods then recommended were too thin for commercial purposes. Bengough and Stuart started the ball rolling with their 3 per cent chromic acid solution in which it was possible to get fairly thick deposits of aluminum oxide. Then came a number of patents in quick succession covering the use of such electrolytes as sulfuric acid and oxalic acid for anodizing purposes. All of these patents are controlled by the Aluminum Co. of America and the process by which aluminum is anodized is known as Alumiliting, the name given it by this company. In Europe, the process is marketed under the name of the Eloxal process. We will not discuss these processes, since they are rigidly protected by patents and they have been described in the literature many times. However, it is of some interest to discuss the manner in which these aluminum oxide films can be colored by absorption.

The color of aluminum oxide is white, and films of it can be made to vary from almost perfect transparency to smoky white. This property permits the manufacture of highly efficient aluminum reflectors protected by aluminum oxide films (commercially known as Alzak reflectors). It was thought until 1925 that the only aluminum oxide finish obtainable would be of this type, then Flick discovered the absorptive properties of anodized aluminum films and this proved to be the necessary shot-in-the-arm for the aluminum anodizing industry.

It was known for years that aluminum oxide is a highly absorptive material (an absorptive material is a material which is highly porous; that is, possesses a tremendous surface per unit mass and can attract and hold other substances on these surfaces). Its use in the purification of water supplies is a common instance

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(hydrous aluminum oxide is formed in the water and this material absorbs many of the organic impurities present). But it remained for Flick to observe and patent this principle in aluminum oxide coatings.

Because of the porosity of the aluminum oxide coating, acid type organic dyes are absorbed in the oxide layer to form fixed dyes or lakes. This gives rise to a number of beautifully colored finishes that are ideally suited for indoor exposures — indoor exposures, because most organic dyes are not exactly light fast and the colors of some of these dyed finishes on aluminum are subject to the same weakness. However, in recent years better types of dyes and "sealing" treatments have been discovered which produce more permanent finishes. Sealing treatments close the pores of the aluminum oxide after the dye has been absorbed and thus prevent "washing out" or staining of the finish. Basic types of dyes, which formerly could not be utilized because they were not absorbed by the aluminum oxide layer can now be made use of by first absorbing a mordant, such as tannic acid, in the aluminum oxide, then following with a treatment with the basic dye which combines with the mordant and remains fixed in the pores of the oxide.

Another class of colors that can be produced in absorbed aluminum oxide finishes are those utilizing inorganic pigments. The colors produced by inorganic pigments are, as a rule, more light fast and durable than those of the organic type. In this class, we have for example the treatment of the anodized aluminum in a solution of sodium chromate followed by a treatment in lead acetate.

The chromate absorbed in the oxide, reacts with the lead acetate to form insoluble lead chromate, a rich yellow color. The lead chromate remains fixed in the pores of the aluminum oxide. Other suitable reactions are available for producing a variety of colors.

Color Oxide Book. The Chicago Oxide Vitreous Enamel Products Co., 1401-47 South 55th Court, Cicero, Ill., has recently issued one of the most comprehensive books on color oxide ever to be distributed to the porcelain enameling industry. In its 24 (8½ x 11) pages, this book presents basic information on what color oxides are, how they are made, and how best to handle and apply them.

This color oxide book carries 115 color chips, grouped as to classification, color combinations and color comparisons. It tells how to blend basic oxides in order to obtain the exact shade desired for any porcelain enameled product, whether for heaters, kitchenware, a major appliance, or a giant spectacular sign. The publishers have avoided the technical aspects of color and color-matching by describing procedures in simple language. They have eliminated to a very great extent the laboratory formula numbers and instead have adopted simple, descriptive names for various color shades. They have separated "basic" oxides from "miscellaneous," and in the manner of presentation, have contributed materially to the simplification of color applications and matchings.

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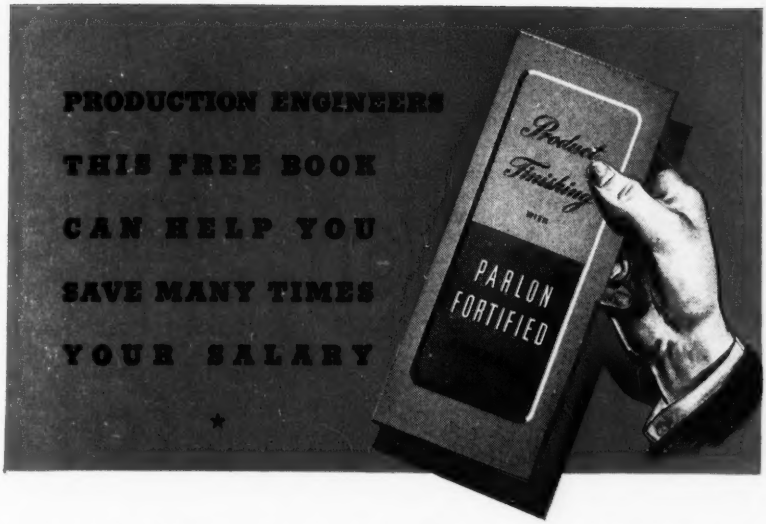

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BARREL FINISHING OF METAL PRODUCTS

The Application of Sodium Silicate in Barrel Finishing Practice.

By H. LEROY BEAVER
Barrel Finishing Consultant
Lansdale, Pa.

THE previous two papers of this series discussed the application of alkaline builders and the more modern wetting agents in regard to their application to barrel finishing lubricating soap solutions. We have been asked to comment on the use of additions of silicate of soda to such solutions and their effect, how and in what proportions they should be used and what purpose they serve.

Many soaps used for barrel finishing application are quite heavily silicated, but in such cases the silicate of soda is generally added to enable the soap itself to contain large proportions of water and yet present a firm consistency. In such applications, the silicate of soda in the form of a concentrated solution is crutched or stirred into the soap in a mechanically operated mixing machine after the completion of the saponification, and it appears to enter into a distinct chemical combination with the soap. While silicated soaps bear heavy watering the silicate itself should not be regarded, as some do regard it, merely as a "filler," because such soluble silicate in itself is a powerful detergent and possesses certain valuable properties and advantages especially when used in hard water.

The forms of market silicates are many and varied and far too great to enumerate, but there are two principal functions that silicates of soda seem to admirably perform in their addition to barrel finishing soap solutions. These two functions are as follows:

"A" A proper silicate of soda addition will provide clearer and cleaner rinsing of parts in process, where water of faucet temperature, for both charging the barrels and rinsing on completion of the barrel finishing operation, is available. In general, this might be stated as water of 68 deg. F. To explain this we may state that of most market soaps, chip, powder or flake used in barreling operations, and where the titer runs from 40 to 43 a water temperature of at least 104 deg. F. is indicated for obtaining a proper rinse. In a wide majority of barrel finishing applications only cold water is available

which makes silicate of soda additions readily apparent as being of distinct value.

"B" Their definite action as a "buffer" or inhibitor in barrel finishing solutions used on the so-called soft metals, including the many alloys of tin, zinc, antimony, and so on, which are liable to attack and to at least a partial surface dissolution by the use of strong alkaline solutions. By such additions, the more powerful alkalies may be used to good advantage and the silicate addition will provide against surface corrosion.

While we regard the above as the principal functions of silicate of soda in its application to barrel finishing practice, we believe the factors to be powerful ones which should in no sense be disregarded in any general contemplation of barrel finishing practice. Aside from the above factors, silicate additions have quite definite wetting properties, and assist very markedly the process known as defflocculation.

One authority in commenting on silicates says:

"These compounds are to be regarded as salts of silicic acid, or combinations of silicon dioxide and metallic basic oxides; they are of great importance, since they constitute the commonest rock-forming and many other minerals and occur in every petrographical species. The parent acid, silic acid, was obtained by T. Graham by dialysing a solution of hydrochloric acid to which sodium silicate had been added; a colloidal silicic acid being retained in the dialyser. This solution may be concentrated until it contains about 14 per cent silica by open boiling, and this solution on evaporation in a

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vacuum gives a transparent mass of metasilic acid, $H_2 SiO_3$. The solution is a tasteless liquid having a slight acid reaction; it gradually changes to a clear transparent jelly, which afterwards shrinks on drying. This coagulation is brought about very quickly by sodium carbonate and may be retarded by hydrochloric acid or by a solution or caustic alkali. Several hydrated forms have been obtained, but are very unstable, some losing water on exposure while others absorb water. The natural silicates may be regarded as falling into five classes, viz., orthosilicate derived from $Si(OH)_4$; metasilicates from $SiO(OH)_2$; disilicates from $Si_2O_3(OH)_2$; trisilicates from $Si_3O_6(OH)_2$; and basic silicates."

In our experimental work, and indeed in very many cases of actual barrel finishing practice we have used, for the most part, only two grades of silicate of soda, both being products of The Philadelphia Quartz Company and known respectively as "G" Brand and "GC" Brand, and which we briefly describe as follows:

"G" Brand. A powder form of sodium silicate of about 100 mesh to the inch fineness and which is used as an inhibitor to protect against corrosion as previously noted. This would be known as a 1:3 silicate, as a matter of fact, 1:3.22 and contains 19.4 per cent of soda and 62.5 per cent of silica, the remainder or 17.5 per cent being water. Since there is no carbonate present, solutions made from this silicate are clear and colorless. Three methods are generally used for putting this 1:3 silicate in solution, and they might be briefly described as follows:

First: Pour the powder slowly into boiling water, constantly stirring to prevent the formation of lumps. It is not necessary to keep the water boiling after dissolution has begun.

Second: Put the required quantity of powder to be dissolved into cold water and then heat, with constant stirring until the powder is dissolved, which will usually be before the boiling point is reached, and

Third: Put the powder into a meshed cloth sack or bag, and hang it into the vessel from the top so that the bag will be just beneath the surface, but not at the bottom of the container, where it will dissolve without stirring.

Relatively large proportions of powder should be used with water, in any case not less than 25 per cent and more preferably 50 per cent of the weight of water used. Smaller quantities than the above will not dissolve, for the greater the proportion of the powder up to 50 per cent the more rapid will be the dissolution.

Liquid solutions of silicate of soda are invariably designated as the percentage in Degrees Baume of solution, and the following table will give the necessary proportions to be used to obtain the corresponding Baume solutions:

Parts of Silicate per 100 parts water	Equivalent weights per gallon	Degree Baume of solution
25	2 lbs. 1 oz.	18
30	2 lbs. 9 oz.	22
35	2 lbs. 15 oz.	25
40	3 lbs. 5 oz.	26.5
45	3 lbs. 12 oz.	28
50	4 lbs. 3 oz.	30
60	4 lbs. 15 oz.	40

In our own practice, we invariably use the greater concentration to secure the 40 deg. Baume solution, and then when adding the silicate itself to a burnishing solution we can use a lesser quantity than if the lighter percentages were used, because from the 40 Baume the solution may be easily reduced by simply diluting with water to the desired degree. Silicate in this form is added to curd burnishing soaps, after the base has been completely melted into solution and the conversion alkalies added, when, depending on the application, the appropriate quantities of silicate are stirred into the solution before it is drawn from the kettle, and is completely blended in the general soap mass.

"GC" Brand is also a powder form of silicate and very closely resembles in appearance the "G" Brand just before described. Its proportions however are different because this grade is known as a 1:2 (soda to silica). It averages 27.5 per cent soda and 55 per cent silica, the balance being water. Due to the fact that a 1:2 silicate of this type is more readily soluble in either hot or cold water, it naturally is the one that would be incorporated in the formula of dry soap burnishing compounds in powder form, as well as being a satisfactory form to add to soap flakes prior to placing them in the burnishing barrel.

In regard to these two types of silicate of soda, their relative rate of solution in both hot and cold water might be of interest, and is stated as follows, the figures being obtained by taking first 100 parts of boiling water and stirring in 33 per cent of silicate boiling and stirring for fifteen minutes, and secondly using the same proportions of silicate powder stirred

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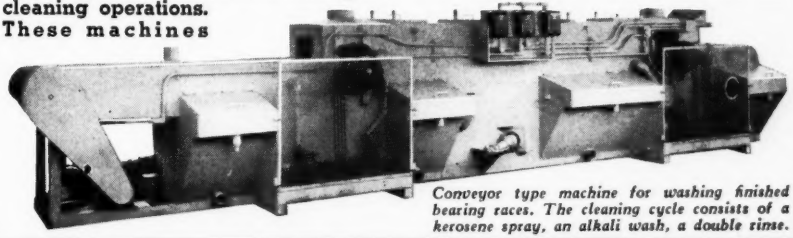

Conveyor type machine for washing finished bearing races. The cleaning cycle consists of a kerosene spray, an alkali wash, a double rinse.

for fifteen minutes in water at ordinary faucet temperature of approximately 68 deg. F.

	"G"	"GC"
Percentage dissolved in boiling water	99.8	100
Percentage dissolved in water at 68 deg. F..	64	98.4

Now with reference to the proper proportion of silicate of soda to use in an average barrel finishing soap solution, this varies depending on the character of the soap base itself, and whether the soap has previously been blended with alkaline builders either to increase its detergent strength, or whether addition agents have been used such as tetra sodium pyrophosphate to either prevent the formation of insoluble lime and calcium soap curds or to provide for dissolution of such insoluble soaps if already formed, and also of wetting agents to lower the surface tension of the burnishing soap solution.

A typical illustration of the use of silicate of soda 1:2 would be in a burnishing soap formula that would list somewhat as follows:

	Per Cent
Tallow Base Soap 42 titer....	66
57 Per Cent Light Soda Ash..	20
1:2 Silicate of Soda.....	14

and in a soap of this kind, a satisfactory burnishing solution will be obtained by the addition of two to three ounces of the soap combination for a small size barrel with a water charge of approximately five gallons and from four to five ounces of the soap compound for a large type barrel using approximately ten gallons of water for the initial charge. The satisfactory functioning of a soap of this type, however, is predicated on first reducing the water supply available from whatever its grains of hardness per U. S. gallon might be to zero hard or soft.

Silicate of soda additions to a burnishing solution also perform an important function as acid neutralizers in cases where through indifferent rinsing following bright dipping prior to barrel finishing operations, acid remainders are carried into the burnishing barrel. Average market soaps and especially when used with hard water and where much of the alkaline content is exhausted in softening the water will benefit very materially in use with silicate additions.

We are not so especially interested in the use of silicate of soda as a wetting agent, because as previously noted, we find in barrel finishing practice that some one or more of the modern agents function very satisfactorily even in concentrations of as small as one tenth of one per cent, but silicate additions undoubtedly help to build up a more resistant lather so that particles of solid soils can be more readily held in suspension and we do not obtain a condition known as a "falling suds" where unwanted matter is redeposited on the surface of the materials or parts in process.

Many of the problems of the applications of alkalies in cleaning solutions do not apply in the case of barrel finishing operations, because we need not be interested in the maintaining of a stable solution for the handling of succeeding lots of work and for the reason that after each cycle of operation the burnishing soap solution is discarded and each new lot of parts for process starts off with its fresh solution.

In general, then, silicate of soda performs its most valuable functions in barrel finishing by its action in preventing the surface attack or etch-

ing of the soft metals and by enabling clearer and cleaner rinses in faucet temperature of water.

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Pickling of Metals for Electro Plating

By Owen T. Towner

IT is well understood that the pickling process has a very definite bearing on the finishing of the final product, and any steps which result in more efficient handling and pickling practice are, therefore, of paramount importance. In the process of pickling iron and steel in many diversified forms, there are three main factors to consider; these are time, temperature, and acidity of pickle. By pickling is meant the cycle of operations from start to delivery for next operation, such as the process of pickling, rinsing, neutralizing, and drying or passing on to the next operation. The time consumed in pickling is controlled by two factors, temperature of pickle and acid strength of same.

The steel companies are responsible for many advances in the art of pickling, and have discarded the old rule of thumb methods and guess work that used to be in vogue. Today in the pickling of metals for sale to trade or for intermediate operations while in fabrication, it is very important to know the proper acid to use, what strength to use and what inhibitor is best for the job, because all steels have a different pickling rate, and even steel of the same analysis will pickle differently owing to the method of their manufacture, as the stresses from heat treatment and cooling rate seem to make the difference.

Considered from a theoretical point of view, the ideal condition for pickling is one which will permit the removal of scale or oxide and rust quickly and completely without any action on the metal itself.

An inhibitor might be defined as a substance which will permit the removal or rapid solution of the various scales or oxide by an acid, and retard the action of the acid on the metal itself. This definition is not limited to iron and steel; but inasmuch as the use of inhibitors is confined chiefly to these metals, we shall in the following limit our discussions to the application of inhibitors on iron and steel.

The significant difference between an iron oxide and a scale is that the scale is formed by pressure, due to rolling of the metal. The term "scale" has been improperly applied to most forms or any form of oxide on iron or steel, but the point to remember is that scale is a sort of a plate in itself, and is formed in the process of manufacture by the heating and rolling operations, where great pressure is employed, and also in forging operations.

There are four common acids used in the pickling; these are, in the order of their importance; sulfuric—muriatic—hydrofluoric—nitric acids.

Attention is called to the fact that muriatic acid is very much more efficient than sulfuric acid, and is used

to remove scales and iron oxides that are more difficult, for the reason that muriatic acid releases only one atom of hydrogen in pickling, where sulfuric acid releases two. Thus it would seem to be more advisable to use muriatic acid in pickling of articles where there is a chance of hydrogen embrittlement, and a mixture of muriatic and hydrofluoric will give a cleaner job on castings where you will find silica or siliceous oxides.

• • •

Effect of Moving Cathodes

By W. M. PHILLIPS

THIS paper opens with a comparison of results between mechanical and air agitation in various types of plating solutions. The work of the author has been a study and recording of the investigation of possible maximum speeds of the work through the solution. Cathodic motion provides a means for increasing the acid concentration which in turn permits the use of higher current densities.

• • •

A Method for Studying Cathode Films by Freezing

By A. BRENNER

THE purpose of this paper is to describe and illustrate a new method for studying the composition of cathode films produced during metal deposition. This method depends upon rapidly freezing the layer of solution in contact with a hollow cylindrical cathode, machining off successive layers of the "ice," and analyzing them. Sufficient data are given to indicate the probable value and limitations of the method. Further work is in progress to refine the method and to apply it to typical electroplating baths.

• • •

Silver Plating at Very High Current Densities

By A. C. SIMON and J. T. LUMLEY

IN seeking new industrial uses for silver, the research staff of the American Silver Producers' Research Project has studied the utilization of silver as a protective lining for industrial containers. The acceptability of silver in tableware over a period of many centuries, and its inertness toward organic acids, caustic alkalies, and certain mineral acids warrant investigations such as the above.

It was found that there was a large potential field for silver-lined containers of two rather distinct types; returnable and non-returnable. The use of silver for a protective lining in a returnable container would justify a relatively high first cost. The probability of scrap recovery and the necessity for sufficient thickness of silver to withstand cleaning and abrasion and thus insure a long service life, warrant fairly heavy coatings. Non-returnable, single-use containers must have a very low first cost, which can be attained only by the use of very thin coatings, employed under service conditions that involve no appreciable attack or abrasion of the silver.

The essential feature of the experimental apparatus was the use of a rapid, constant flow of plating solution past the cathode surface. Circulation was obtained by means of a pump that was driven at approximately 1,700 r.p.m. by a ¼ h.p. mo-

tor. The plating chamber consisted of a vertical iron pipe, which was directly connected at its lower end to the discharge side of the pump. This chamber contained a removable bakelite tube, which carried contacts for the cathode and supported a central anode, insulated from the cathode. The plating chamber was surrounded by an outer jacket, which was connected at its lower end with the inlet side of the pump. The outer jacket had a removable lid which allowed for insertion of the electrodes, and formed a closed system when the pump was in operation. The outer jacket served as a reservoir which received the overflow from the plating chamber. The capacity of the pump was about 25 gallons (100 liters) per min. The apparatus and pump held a total of about 1 gallon (3.5 liters) of plating solution.

Instead of using the formed shells in exploratory tests, sheet steel with a similar finish was employed and was bent into cylinders of the proper size. The steel used in the production of seamless can bodies is designated as "commercial can stock of deep drawing quality, mill finish black sheet." The material used in these experiments was a commercial grade of bright finish, low-metalloid, rimmed open-hearth steel, such as is used in the production of automobile bodies. In general appearance and composition, this steel was similar to the can stock, although having a somewhat brighter surface finish.

With this type of apparatus, the following factors appear to govern the plating of cylindrical steel bodies.

1. The permissible current density to produce smooth adherent deposits may be increased by:
   (a) Increasing the silver content of the bath.
   (b) Increasing the content of free cyanide.
   (c) Increasing the temperature.
   (d) Increasing the agitation.

Under favorable conditions, with good agitation, current densities of at least 200 amp./ft.^{2} (21.5 amp./dm.^{2}) may be used, at which over 0.0003 inch (0.0076 mm.) thickness of silver may be deposited in one minute.

2. The cell voltage in these tests ranged from 4.5 to 7.5 volts. The current density produced by a given voltage was slightly decreased by raising the silver content and was increased by raising the free cyanide or by raising the temperature. The principal cause of these effects was the change in conductivity of the solution.

3. Cathode polarization apparently has only a small effect on the current density. If silver anodes were used, with necessarily a smaller area and a higher current density than on the cathodes, a black film formed on the anodes and the polarization was very high. In the experiments reported, steel anodes of the same size as the silver anodes were, therefore, used.

4. An increase in free cyanide generally decreased the porosity.

5. The porosity of silver applied over pore-free copper coatings is much less than when applied directly to steel or over a copper strike.

6. The cathode efficiencies under favorable conditions are from 60 to 70 per cent.

• • •

Plating Shop Economics

By M. M. Beckwith

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through the technical journals for this twenty-year period to see the many improvements in the plating practices to realize that the field has established itself as a major industry. If space permitted, the author could go through a resume of the new developments during this period, which would include the advent of chromium plating, commercial plating of alloy coatings, the introduction of bright nickel, and other bright metal plating. These subjects have been covered adequately in many good articles. Considerable has been written in regard to the difficulties met each time a new process in electroplating has been introduced. As time passes, these difficulties are usually ironed out.

Theory and practice have kept pace during this time. Any progressive foreman plater or manager of a plating department or plant specializing in electro-finishing realizes the necessity for maintaining a contact with his fellow-workers and with published literature. Much of the "magic" and "hokum" has been taken out of plating, thereby changing the field of plating from an art to a science. While this is not entirely the case, the trend is very pronounced. In view of the fact that the general essentials of plating practice and solutions have been covered adequately, this paper will not go into detail on that phase of the subject.

There is one thing that many of you may disagree with, but upon giving it consideration you may find that it is true. That is, one of the most difficult things to do is to THINK. The best motto for anybody to adopt is "Try Thinking!" By thinking, I mean reasoning and observation coupled together to arrive at a new conclusion. For example, this obviates taking for granted any operation throughout a plant.

One of the greatest sources of loss throughout any shop is that of wasted effort or lost motion during the many steps in operation. The path over which an operator travels determines the amount of energy he expends in accomplishing a given amount of work. By this I mean if he takes three extra steps per trip, it is obvious that his personal wasted effort is considerable at the end of an eight-hour shift. This brings us to the point of plant layout.

One of the most important considerations in a plating room is the generator. L. L. Soffell, in "The Monthly Review," discusses extensively the sources of troubles and their solutions. He points out that the generator must be kept clean. The cost of a partition between the plating tanks and the generator is minor

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compared with the effect on generators of contamination by plating solutions. Such a partition could be easily built with wood at a very reasonable cost.

The question of safety is one that cannot be emphasized too much. One small accident may cost more than can be saved in all labor and time saving devices installed in a plant. The question of safety in the plating room involves slippery floors, poor electrical connections, poorly ventilated tanks, and numerous apparently insignificant sources of trouble. It is most important that one have First Aid material on hand and force operators to use bandages or First Aid no matter how slight the injury. It is surprising how many serious effects come from ever so small injuries, including minor scratches. A diligent application of Safety, First Aid, and Good Housekeeping pays dividends.

In summary—let us say that in order to accomplish savings in a plating plant, it is necessary to apply a thorough course of study to all the processing operations. This cannot be done by a cursory glance through the plant, nor can it be done by reading of the published articles on any type of solutions or trouble shooting. Diligent effort must be put forth continually to accomplish results. Changes that one may make today may be obsolete in a month. Those who are operating shops where the jobs change regularly should be even more diligent in the pursuit of economics in the plating room. There is one motto that could well be adopted by all of us and used daily, and that is—TRY THINKING!

• • •

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The Cathodic Treatment of Copper in a Solution of Beryllium Sulfate to Prevent Tarnishing

By Dwight T. Ewing and George W. Jernstedt

WORK on the protection of metals by electrolysis in solutions or beryllium sulfate was first reported by Thomas and Price in 1938. The results of their work showed that a certain degree of protection could be secured from films cathodically deposited from such solutions. They employed a simple bath consisting of beryllium sulfate and sufficient ammonium hydroxide to adjust the pH to the required value. Upon attempting to duplicate their work, it was found very difficult to secure a coat-

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ing without a coloration which was due to the interference patterns of the film. Furthermore, a blushing of the copper surface beneath was noted.

This investigation was undertaken to determine more definitely the optimum pH of the solution, the effect of a buffer, heat treatment of the electro-deposited film, and the thickness of film necessary to prevent tarnishing, and so on.

It was decided at the outset of the investigation to thoroughly standardize plating procedures, methods of measurement, apparatus, and other experimental conditions. This was done so that the results of varying one factor at a time could be observed.

1. Copper may be treated cathodically in a solution of beryllium sulfate and ammonium hydroxide to give it excellent protection against oxidation in air at elevated temperatures or tarnishing from sulfur fumes.

2. Deposition is made from a bath containing 3 to 4 g./l. of beryllium sulfate nearly neutralized with ammonium hydroxide. The film is probably composed of collodial beryllium hydroxide which has a positive charge in solution and migrates towards the cathode when a potential is applied.

3. The addition of 3 to 5 g./l. of boric acid to the bath causes coagulation of the larger collodial particles. This leaves the smaller particles to be plated out, which aids in forming a transparent and colorless film.

4. General operating conditions include: Anodes of 7 per cent tin and 95 per cent lead, a current density range of 50 to 100 ma./sq. ft. for a period of 4 to 6 minutes, the pH of the solution is initially adjusted to between 5.5 and 5.9 and may be operated as low as a pH of 4.9. Dry film carefully and heat a few minutes at 275 to 300 deg. C.

5. The film is limited to a thickness of approximately 4 millionths of an inch, this being atttained after the the maximum potential has been reached during electrolytic treatment. The film, although limited to this small value, will withstand rubbing with non-abrasives, the main weakness being its low resistance to mechanical abrasion.

6. The peak voltage is an indication of the protective power of the film only for a given current density and bath composition. Otherwise the two factors are not related.

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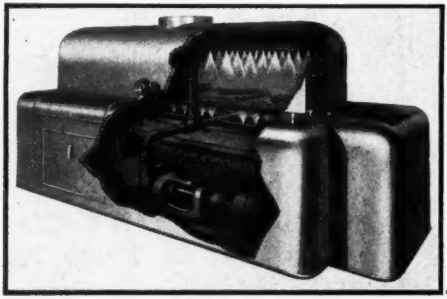
Study of Sodium Stannate Tin Plating Solution

By Frederick Bauch

THE sodium stannate bath is now the most widely used tin plating



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solution and is used successfully on small tanks and on large, fully automatic plating conveyors. It combines excellent throwing power with a smooth, compact deposit over a fairly wide range of conditions. However, considerable difficulties may arise due to incorrect anode current density.

This paper covers the study of the sodium stannate tin plating solution which has been conducted to collect data concerning factors causing difficulties in the electrodeposition of tin and to find optimum operating conditions.

1. Bivalent tin ions in a sodium stannate tin plating solution cause bulky, porous, and blistered deposits. For this reason they are not desirable.

2. The anodic behavior of tin in the sodium stannate solution is more constant when the free causticity is held 1 oz./gal. The addition of 2 oz./gal. of sodium acetate improves this condition.

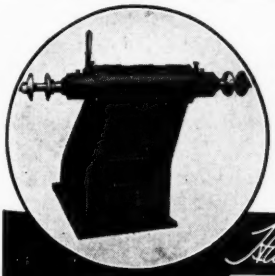
3. A hydroxide film forms on the tin anode in an alkaline tin solution when the current is off. Unless this film is removed by an initial increase of the current density, the tin is dissolved as stannite. This high current density is required for a short period only and it is desirable to reduce the current later to a practical value, in order to obtain a high anode efficiency. Unless the source of electrical energy is designed for an overload, it must be of greater capacity then required for actual operation.

4. The anode current density must be maintained within a certain range. The optimum current is used when the anode is coated with a yellow, greenish film and the gassing at the anode is slight. It is difficult to maintain this condition when tank load varies greatly. For this reason the solution should be operated with full tank loads only and on plating machines dummy cathodes should be used for any missing load.

5. An excess of bivalent tin ions may be observed in the color of the bath. It is best to operate the solution so that no stannite is formed. The formation of bivalent tin ions is accompanied by a low potential across the solution. This phenomenon may be used as an indicator.

6. Excess oxidizing agents lower the cathode efficiency and may attack the ware, especially brass or copper immersed in the solution when the current is off. Oxidizing agents should be diluted and added to the solution with vigorous stirring.

7. The above conclusions show that a sodium stannate bath may cause considerable difficulties, as the bath can only be operated within a nar-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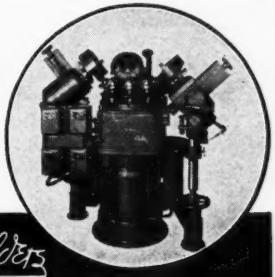
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row range. This requires a fairly constant load. The best method is to keep the bath fully loaded and to replace ware removed from tank as it is removed, rather than load and unload the entire tank.

In tanks such as continuous platting machines, better results are obtainable if the load is fairly constant. If not loaded fully, dummy cathodes have to be used on carriers to take up the missing load. These dummy cathodes may be used later as anodes and deplated.

8. The composition of the tin plating solution may be maintained through proper balance. It is more economical to plate the tin from the anodes instead of from the stannate. Assuming a price of 46 cents per pound of tin and 75 cents per pound of tin as stannate, a savings of approximately 25 cents per pound of tin plated is possible. The Frigidaire Corp., Dayton, Ohio, operates a platting machine of approximately 9,000 gallon solution with practically no addition of sodium stannate. No hydrogen peroxide is used. The drag-out is salvaged by a still rinse tank which is used for replenishing the solution.

9. It is of a definite advantage to have the tank containing the solution lined with a non-conducting material to eliminate the previously mentioned galvanic cell action. This will also prevent the possibility of the tank acting as anode or intermediate cathode.

• • •

The Electrodeposition of Lead from Lead Acetate Solutions

By Frank C. Mathers and
Joe B. Schwartzkopf

COMBINATIONS of glue and cresol as addition agents were found to produce solid, thick, finely crystalline cathode deposits from lead acetate solutions containing sodium acetate and free acetic acid. The effect of the concentration of all the components has been outlined. A current density of 1.2 amp./dm.^{2} (11 amp./ft.^{2}) may be used. Thin deposits of lead, .001 in. and .003 in., on steel were sufficiently adherent for soldering.

1. Combinations of glue and cresol as addition agents were found to produce smooth, thick, finly crystalline deposits of lead from lead acetate solutions.

2. The presence of sodium acetate or some similar salt was necessary to obtain good deposits.

3. A low concentration of free acetic acid produced the best deposits.

4. The following bath composition is recommended: 10 g. $PbAc_2$. $3H_20$, 12 g. to 16 g. NaAc . $3H_20$, 2 g. HAc, 0.4 g. to 0.6 g. of glue, and 3 to 4 drops of cresol (in a sodium hydroxide solution) per 100 ml. of solution. Five to seven drops of crude cresol may be used.

5. Too much cresol tends to produce dark deposits.

6. The baths were somewhat turbid. Filtering seemed to have little effect on decreasing the turbidity.

7. A current density of 1.2 amp./dm.^{2} (11 amp./ft.^{2}) may be used.

8. Agitation of the baths during electrolysis was desirable.

9. Lead deposited on iron was sufficiently adherent for soldering.

10. The advantages of lead acetate baths for lead plating are: (a) The baths can be produced conveniently from commercially available materials; (b) the components of the bath are comparatively cheap; and (c) the bath does not attack ceramic vessels.

11. The disadvantages of acetate baths are: (a) The low conductivity increases the power cost; (b) the deposits are somewhat brittle due to the large quantities of addition agents required; and (c) the adherence of thick deposits on iron is often not good.

• • •

Hard Plating Plastic Molds

By A. Locozzo

THE introduction of plastics to the industrial world has broadened many fields of endeavor — designing, drafting, chemistry, metallurgy, engineering, toolmaking, and last but most important to this gathering, plating. The first step in this field for platers is the chromium plating of plastic molds. A plated mold to the molder is what a well equipped car is to the car owner—a deluxe job.

There are two distinct phases to the modern industrial chromium plating field which are designated as:

1. Flash plating involving thicknesses up to .0005 (five ten thousandths) of an inch, and

2. Hard plating with thicknesses ranging from .005 and upwards of .030 (thirty thousandths) of an inch. The pre-requisites of a chrome plated mold, namely, a minimum thickness of .001 (one thousandth) providing a file hard, wear resisting surface, inadvertently places it in the hard plating phase of the chromium-plating industry, thus the title of this paper.

After acquainting ourselves with some of the basic materials used in plastic molding and viewing the molding cycle we can appreciate what the molder is up against and readily understand why chromium plating is es-

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WOOD TANK MFG. CO.
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sential to the industry. Judging from the experience we have had with plated molds we assume the following qualifications necessary for continued successful chrome plating of molds.

1. Correct hardness of base Rockwell C56.
2. Highly polished, defect free surface.
3. Perfect adhesion.
4. Uniform deposit.
5. Minimum thickness .001.
6. File hard surface.
7. Highly finished plated surface, insuring a low co-efficient of friction.

The advantages of plating molds taken from a molder's viewpoint may be summarized as follows:

1. Corrosion resistance.
2. Free extraction of molded part.
3. Higher finish of molded part.
4. Longer wearing life of mold.
5. Better flow of compound.
6. Uniformity of molded pieces over a period of time.

• • •

A Short Research on the Effect of Basis Metal Polishing on the Character of Nickel Plate

By W. L. Pinner

THE effect of surface condition of the basis metal on porosity of electrodeposits has been frequently mentioned. Among many authors, to select a few noteworthy examples, Hothersall and Hammond discuss surface roughness as being one of five major contributing factors to porosity. Phillips discovered that a nickel plate on a rough polish is more porous than a similar plate on a smoother polish. Bower, in a recent publication, revealed that loose grain polishing, comparable to a burnishing operation, provided a surface for a plate of superior quality to that obtained from ordinary polishing procedures.

Specific and detailed information on the effect of a well-defined basis metal defects on the plate is not yet available. Thus, as a generality, nonmetallic inclusions, pores, scratches and other similar imperfections in steel have been more or less vaguely defined as being harmful to the corrosion resistance of a plate subsequently applied. Sand blasted surfaces have been described as being inferior to polished surfaces. On the other hand, unpolished surfaces of good cold rolled steel have been shown to present an excellent base for a plate, whereas polishing such a surface decreases the corrosion resistance of the plate.

It follows, therefore, that if perfect steel could be used for plating, and if articles could be fabricated with the development of necessity for

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polishing, then a research such as the one here reported would be unnecessary. The plater or corrosion engineer could then devote his entire attention to means of prevention of porosity as created in the plating operations. However, neither of the above conditions are even remotely possible of attainment. Therefore, one does need to be concerned with the steel and with the damage, or improvement, obtained through polishing. It is the author's opinion that, in a well conducted plating process, far more than half of all corrosion difficulties are a result of the condition of the basis metal.

This research, unfortunately brief, is an attempt to lay the groundwork of a more complete investigation of the effect of different types of polishing on steel. The results, published as obtained, are admittedly too few in number and hence might not properly be designated as conclusions. However, the trend of the corrosion results obtained was quite definite, justifying their publication and justifying further work in seeking a reason for them.

More specifically, this paper describes an attempt to determine the effect of several different kinds of rather well defined polished surfaces on corrosion resistance and other characteristics of the plate obtained. It is the author's firm conviction that such work as is here published should be amplified and further extended in some like manner to all basis metal defects as mentioned above.

M. S. A. Hose Mask Bulletin No. EB-4. According to an announcement made by Mine Safety Appliances Company, Braddock, Thomas and Meade Sts., Pittsburgh, Pa., a new descriptive bulletin is now being issued dealing with the application of an All-Vision Facepiece to the company's line of hose masks.

These masks now feature greatly increased lens area of the facepieces. The non-fogging, large-area lenses of laminated shatterproof glass are said to permit complete vision through all viewing angles. The lenses are countered at the sides to fit the wearer's face. Built-in fogproof construction assures that incoming air will keep the lenses clear of condensation at all times. The All-Vision Facepiece readily fits any face with perfect gas-tight seal eliminating pressure points; minimum dead air space cuts down rebreathing of exhaled air. The facepiece can be sterilized at will, without harm, and will give lengthy service life.

Copies of the new M. S. A. Hose Mask Bulletin No. EB-4 may be obtained by writing this publication, or direct to Mine Safety Appliance Company, Braddock, Thomas and Meads Sts., Pittsburgh, Pennsylvania.

Lift Skids. Bulletins describing barrel and drum lifting skids are now being issued by C. E. Farrington Company, Phoenixville, Pa. These bulletins are profusely illustrated and show various applications of the lift skids.

Copies will be sent free upon request.

Will using a pre-finished metal cut your production costs? Here is an opportunity to find out . . . at our expense. We supply you — without cost or obligation — with enough metal to conduct a conclusive cost comparison test in your own plant, on your own product, according to your own system of accounting. Write for complete information on this offer. This test may be the most important step in your company's history.

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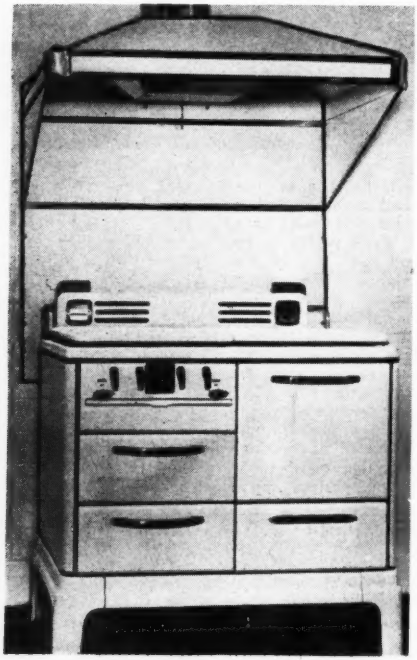
Finishes THAT AID IN APPEARANCE AND UTILITY

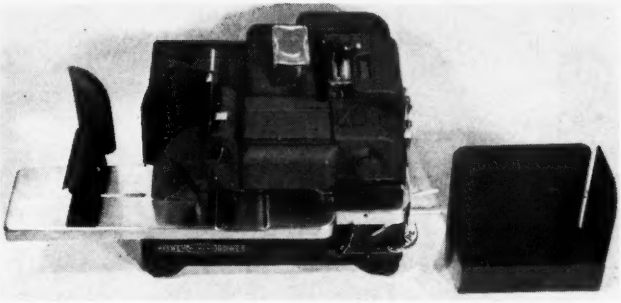
(Right)—Modernly designed for utility, performance, and eye-appeal, this refillable rubber paper cement can is attractively lithographed in horizontal, alternate color stripes.

(Photo Courtesy Modern Packaging Magazine)



(Photo Courtesy American Rolling Mill Company)

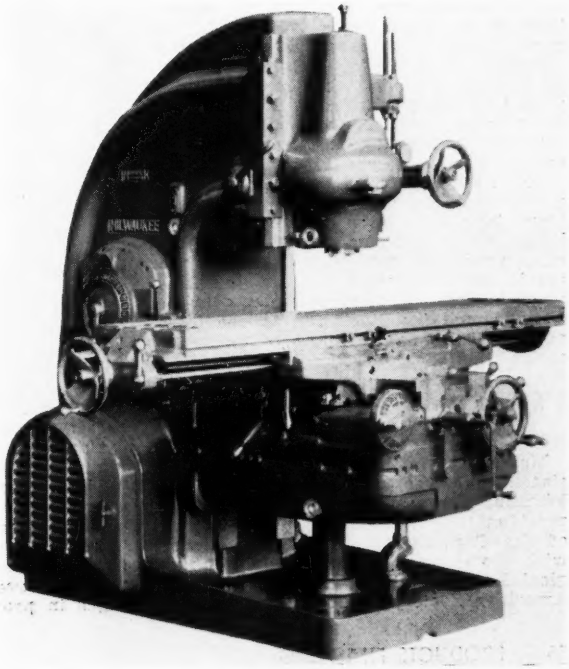
(Left)—This handsome kitchen ventilator, known as the "Vent-A-Hood" is made of Armco Paintgrip sheets, the galvanized metal with a special Bonderized finish that takes paint and holds it. Whether it is finished in white, or in colors to match a favorite color scheme, the baked-on Dulux surface will not flake or peel from room heat.



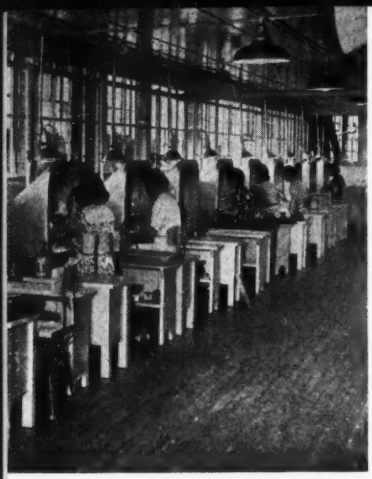
(Photo Courtesy Pitney-Bowes Postage Meter Co.)

(Above) — Wrinkle finish, polished stainless steel, satin finish nickel, and baked enamel lettering feature this new streamlined postage meter.

(Photo Courtesy Designers for Industry)



(Right)—Seven tons of streamlined beauty, this vertical milling machine is a demonstration of how appearance creates an impression of efficiency, sturdiness, and durability.



News OF THE INDUSTRY

Magnus Training Program

An extended sales training program is being conducted by the Magnus Chemical Company, Inc., Garwood, N. J., manufacturers of industrial cleaning material and metal working lubricants.

In a series of four-day meetings being held at various centers, such as New York, Boston, Philadelphia, Cleveland, Chicago, and Atlanta, the members of the sales organization meet in regional groups to participate in a most intensive sales study. While based on all phases of selling activities, the subjects of these meetings are directed specifically to the selling of certain leading Magnus products, with some emphasis on the whole line.

The entire program is under the supervision of David Blanchard, vice president in charge of sales, the meetings being conducted by Herb Mercready, sales promotion manager. Already, the results of the program adopted this year in lieu of regular sales conventions, is making itself felt in the form of increased sales in many of the territories thus far covered.

Deuble with Copperweld Steel Company

Mr. Norman L. Deuble is now associated with the Copperweld Steel Co., Warren, Ohio, as assistant to vice-president. Mr. Deuble is a graduate of the Case School of Applied Science with the degrees of B.S. and Metallurgical Engineer; he is a member of the American Society for Metals and of the Society of Automotive Engineers (a member of the Iron and Steel Committee of the S. A. E.). Mr. Deuble was previously with the Republic Steel Corp. and has been associated with the Central Alloy Co. and the United Alloy Steel Co.

Cleaning Developments Discussed at Oakite Conference

Held last month in New York City, the annual Spring Technical Sales Conference of the Northeastern and Philadelphia Divisions of Oakite Products, Inc., reviewed several recently developed and improved cleaning materials designed for effectively handling an extensive range of production and maintenance cleaning operations. Attending the two-day session were over forty Oakite field service representatives, together with members of the Company's technical and service staffs.

Two recent developments of particular interest to the metal-working industry commanded major attention. The first was Oakite Composition No. 54-B, an improved material which has made possible the electro-cleaning of polished steel and buffed copper in a single tank, before plating, without the need of presoaking or subsequent wiping or brushing.

The second new development discussed was Oakite Pickle Control, a soluble, non-foaming type of inhibitor that is reported to reduce hydrogen embrittlement, improve working conditions and provide several other notable advantages in production pickling operations.

Among other subjects discussed were safely cleaning brass, aluminum and aluminum alloys and die castings; and preventing water stains on finished metal products.

William Andrew Harshaw Passes

William Andrew Harshaw, chairman of the board of the Harshaw Chemical Company, Cleveland, Ohio, died recently at his estate in Gates Mills after a prolonged illness. He was seventy-eight years of age.

A native of Dodgeville, Iowa, Mr. Harshaw began his business career with the Meyer Brothers Drug Company, Kansas City, in 1881, with which organization he remained until 1884, when he joined the Lord Owens & Co., wholesale druggists, Chicago. Five years later he went to Cleveland to join Strong, Cobb & Company, to take charge of its chemical sales department. After three years with the Strong, Cobb organization, Mr. Harshaw entered business on his own account, forming the Cleveland Commercial Company, chemical merchants and brokers. In 1893, Ralph L. Fuller was taken into the business, and in 1895 Wallace B. Goodwin became a member of the firm, which reorganized in 1898 as the Harshaw, Fuller & Goodwin Company.

Mr. Harshaw served as president of the Harshaw, Fuller and Goodwin organization from 1898 to 1924 and chairman of the board until 1929, when the company was named the Harshaw Chemical Company. He was president of the Harshaw Chemical Company until 1936, when he became chairman of the directorate.

DeVilbiss Training School

The DeVilbiss Company, 300 Phillips Ave., Toledo, Ohio, has announced the schedule of its training school for the last half of 1940. The training school is held in the company's Toledo plant and is open to industrial painters, master painters, automobile refinishers, and all others interested in learning the technique of spray painting and the use and care of spray painting equipment.

Each period lasts for one week. The following dates mark the opening classes: August 26, September 23, October 21, and December 29.

Special rates in Toledo hotels and boardinghouses near the plant have been secured by the company for men attending the school.

These classes have been well attended in the past because of the facilities for study otherwise unobtainable, offered by the DeVilbiss Laboratories.

It is advsiable to enroll in the school as far in advance as possible, since the size of the classes must be limited, and since there will be no training period other than those announced.

Additions to O. Hommel Company

The O. Hommel Company, Inc., Hope St., Carnegie, Pa., announces that contracts have been let for the construction of a new warehouse and the addition of a one-story building to the office. Both the warehouse, which will include 10,000 sq. ft. of floor space, and the office addition, will be constructed of gray porcelain enamel. This material was chosen, according to the O. Hommel Company, because of its imperviousness to the elements and low maintenance cost.

Ferro Announces Installation

The Roesch Enamel Range Company, Belleville, Ill., is installing a second oil-fired continuous furnace, duplicating its present furnace, installed two years ago. A building-addition is involved. The new furnace is a Junior U-Type with a full Alundum muffle. It is being supplied by Ferro Enamel Corporation, of Cleveland, Ohio.

This company has also announced the installation of an oil-fired straight-through type continuous furnace with full Alundum muffle in The Toledo Porcelain Enamel Products Company, Toledo, Ohio. The company fabricates and porcelain enamels metal products for a wide variety of manufacturers and also manufactures its own Toledo line of porcelain enameled building-parts.

The Co-operative Enameling Company, Cleveland, Ohio, is moving into larger quarters, nearby the present location. A new oil-fired Junior continuous porcelain enameling furnace with full Alundum muffle will be installed in the new plant by the Ferro Enamel Corporation. One of the company's two box-type furnaces will be moved to the new location at a later date.

The Leonard-Baker Company, Taunton, Mass., stove manufacturers, has purchased from Ferro Enamel Corporation, Cleveland, Ohio, a 3-foot by 5-foot box-type porcelain enameling furnace. The unit is oil-fired and represents the latest developments in box-type furnace design. The furnace was built in Cleveland, and shipped to Leonard-Baker in assembled form.

Pennsylvania Salt Manufacturing Company Appoints Advertising Manager

Mr. H. M. Ellsworth, who for many years was advertising manager of the Sterling Products Company, Easton, Pa., has been appointed manager of advertising of the Pennsylvania Salt Manufacturing Company, 1000 Widener Bldg., Philadelphia, Pa., and its subsidiaries effective July 1, 1940, succeeding Miss I. J. Dennery, who has resigned effective that date.

W. Leslie Lawrence Elected Secretary of Alexander Milburn Company

W. Leslie Lawrence was recently elected secretary of the Alexander Milburn Company, 1424 W. Baltimore St., Baltimore, Md. Mr. Lawrence filled various positions with the company, first as Baltimore representative, then on national sales, and a short time ago became one of the company's directors. He is well acquainted in the paint spray field.

Mr. Lawrence succeeds Mr. Harvey H. Johnson, who passed away on June 2nd after serving the company for 25 years.

New Film Tells Importance of Chemical Coatings

How chemical coatings are vital considerations in modern industry and how they are important to everyday living is explained in the new all-color, sound movie, "More Than Meets the Eye," released this month by Interchemical Corporation, 75 Varick St., New York City.

Chemical coatings — inks, industrial finishes and enamels, textile colors, and other protective and decorative materials—are shown in this film to be important sales influences. It is pointed out that performance today is often taken for granted in a product. But the appearance of the article can "make or break" a sale, whether the product be a refrigerator, a household appliance, a magazine, a printed shirt, or a dress fabric.

In many cases, the chemical coating may be important as adding to the life of the product. For example, when a woman buys a dress her first thought is usually "How does it look?" Then if she likes the pattern, she will want to know whether the colors will be fast to sunlight and whether they will remain bright after repeated washings.

"More Than Meets the Eye" describes the processes and research back of the manufacture of these coating materials and shows how the requirements of the ultimate consumer must be taken into account in the manufacturing operations. The enamel finish for a washing machine, for example, must produce a surface so tough that it will resist the chipping and marring and the various deteriorating forces to which the product will be subjected in the user's laundry.

The functions of the various divisions and subsidiaries of Interchemical are outlined in the picture. These units are engaged in producing printing inks, in-

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dustrial finishes, textile colors, dry colors and pigments, press equipment, and various related products.

"More Than Meets the Eye" was produced by Willard Pictures, Inc., under the direction of George Welp, Interchemical Corporation.

The film has been prepared so that it will be of interest to manufacturers of products requiring chemical coatings and to the general public which uses these products. Since much of the picture is concerned with the production and application of industrial colors like printing inks, pigments, finishes, and textile colors, there are many spectacular color effects.

This movie is available for showings to manufacturers, associations, or groups interested in chemical coatings and their importance both in industry and in our daily living.

Committee Meets to Discuss Fifth Annual Porcelain Enamel Institute Forum

The committee in charge of the annual Forum of the Porcelain Enamel Institute met recently to make plans for this year's meeting at the University of Illinois, in Urbana.

It will be the fifth meeting of its kind sponsored by the Porcelain Enamel Institute, and the Forum Committee is very much pleased to observe how enthusiasm for it has increased each year. Enough suggestions were received in the last few months to make up several full programs, and after careful selection, the committee drafted a tentative list of speakers and subjects covering generally, the interests of every branch of the industry. Each session will be devoted to the study of problems with which every enameler is faced.

As soon as it is arranged, this tentative program will be released. In the meantime, don't forget the Forum dates —October 16th-17th-18th. It's going to be a very interesting meeting.

Supply Situation on Potassium Cyanide Solved by General Chemical's Domestic Manufacture

The scarcity of Potassium Cyanide, a chemical much used in the gold and silver plating industries, has now been relieved by the domestic manufacture of this chemical on a commercial basis by General Chemical Company. The supply of this material previously depended entirely on import, mainly from Germany, which has been completely cut off due to the war.

General Chemical Company, one of the largest producers of Sodium Cyanide, conducted extensive experimentation for several years on the production of Potassium Cyanide, and the product they are now manufacturing is said to be equal to or better in quality than the previously imported material.

General Chemical Company Potassium Cyanide approaches reagent grade standards of purity. It is 94-96 per cent KCN in strength, readily soluble in water and low in solubles. Its appearance differentiates it from imported material in that it consists of pure white, glistening granules, all screened through 8 mesh.

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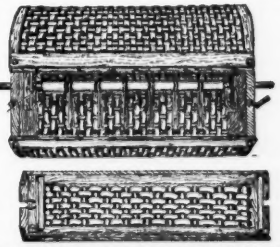

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Durability of Porcelain Enamel Demonstrated

ONE of the earliest porcelain enamel-on-steel buildings erected in this country is the porcelain enameled residence, sponsored at Cleveland, Ohio, by Ferro Enamel Corporation of that city, manufacturers of porcelain enamel, colors, and other porcelain enameling materials. The residence was built in 1932 as "the world's finest" porcelain enameled residence and was sponsored to demonstrate the advantages of porcelain enamel. A recent report by the architects and engineers, Charles Bacon Rowley and Associates, Inc., of Cleveland, Ohio, indicates the material is standing up satisfactory. A report by the resident-owners, Mr. and Mrs. Francis A. Kitchen, indicates low maintenance costs.

The written report by Charles Bacon Rowley and Associates reads: "We have examined, within the last few days, the Ferro Enamel house located on Campus Drive, just north of Cedar Road, and east of Green Road in Cleveland, Ohio.

"The house is porcelain enamel shingle construction on the wall as well as on the roof and is now over eight years old. If it were cleaned by washing, it would look almost like new. There are a few shingles where they were cut so as to leave a raw edge, and only in these instances is there any evidence at all of the steel beginning to rust.

"We are confident that this residence will last a long time, and for a very small washing cost, it would look almost new. The colors have not faded, nor have they in any way deteriorated."

The resident-owner, Mr. Francis A.

Illustration made from a recent photograph of porcelain enamel-on-steel residence sponsored and built at Cleveland, Ohio, by Ferro Enamel Corporation in 1932.

Kitchen, states: "Fuel bills have been very reasonable and fire insurance rates are low because of the virtual fireproof construction, which puts the house in the preferred risk class. The house has never given any trouble and the only noticeable deterioration is a crack in the clay tile chimney and from rusting on the iron grillwork around the front of the entrance. The house has never been washed, except by natural rains, yet looks bright and new."

The house is styled in a modified Georgian manner. The body color is deep tan with rich brown stipple. Four courses of blue-green shingles around the base of the house and two rows of the same color under the coping form an artistic trim. Three shades of russet in mottled effect are employed on the roof. All shingles were porcelain enameled by the Vitreous Steel Products Company, Cleveland, Ohio.

The "world's first" porcelain enameled residence proved a sensation when it was opened in 1932. A total of 25,000 people visited the house the first month, including many architects and builders.

Since 1932 the use of porcelain enamel as a building material for filling stations, small buildings, shops, stores, bus stations, railroad stations, and other types of structures has grown steadily. Sales of architectural porcelain enamel have increased from almost nothing in 1932 to an estimated two million dollars for 1940, according to figures recently released by Porcelain Enamel Institute, Inc., Chicago, Illinois.

Bristol Electronic Pyrometer Controller. A bulletin describing a new electronic pyrometer controller is now being issued by The Bristol Company, Waterbury, Conn. Moving parts in the control unit—such as motors, depressor bars, toggle switches, and open contacts—are said to be completely eliminated.

The pointer of the Weston millivoltmeter movement is not engaged or retarded at any point within its normal operating range, thereby leaving it free to continuously indicate the temperature under control. This measuring unit is equipped with a cold-end compensator, insuring high accuracy.

Control is accomplished by means of a new electronic circuit, using a single high-output vacuum tube of the all-metal type. This tube has a useful life of several years. A milliammeter on the front of the instrument indicates the condition of the control circuit at all times.

Due to the Bristol's Millivac Relay, the controller is extremely sensitive to changes in temperature at the thermocouple. The entire operating mechanism of this relay is totally enclosed in a vacuum.

A copy of the bulletin may be obtained upon request.

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The Varnish Products Co.
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THE Finishing FORUM

Procedure for Finishing Metal Caskets

By Robert King

AFTER extensive research and factory surveys the described method herewith of finishing metal caskets has been found to work out to perfection in factory production and results in a finish that will excell most others.

Most metal caskets are made of lead coated metal, such as the well-known brand "Armco." As is well known, lead coated metal is very difficult to lacquer, although it also has the good property of being non-rusting. The cleaning of such metal is accomplished in some plants by the use of a good metal wash, similar to the phosphoric acid washes. These washes etch the metal surface and provide good adhesion for a lacquer coating.

It should be borne in mind that when acid washes are used, perfect removal of all acid is essential in order to obtain a non-spotting job when light silver finishes are required. A good lacquer cleaner is being used with success to remove all grease and dirt. Sanding may then be done with a 6-0 paper, using light naphtha. This will scratch the surface slightly and remove all remaining dirt from any pores, finally cleaning off with lacquer cleaner. The selection of a

Do you have a metal finishing problem?

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If there is a "kink" or short cut in use in your shop, send in a description of it. Each one published will be paid for.

No. 21 Solids Content

Determination of the non-volatile solids content of an organic finishing material.

APPARATUS: Cylindrical glass weighing dish (flat form, 30 x 50 mm), tongs, balance.

PROCEDURE: Carefully weigh out five grams of the full bodied paint into the weighing dish. Tilt the dish to distribute an even film over the bottom. If the material is an air drying lacquer, heat to one hundred degrees Fahrenheit for three hours, cool and weigh. Repeat this procedure until there is no more evaporation. For a baking material, subject the weighing dish with its sample to the regular baking schedule, cool and weigh.

CONCLUSIONS: The weight of the dried or baked sample divided by the weight of the wet sample and multiplied by one hundred is the per cent non-volatile solids content of the organic finishing material.

No. 22 Weight per Gallon

Determination of the weight per gallon, in pounds, of an organic finishing material.

APPARATUS: Hydrometer, thirty-two fluid ounce graduate, balance.

PROCEDURE: Stir the paint thoroughly and bring it to seventy degrees Fahrenheit. Allow the hydrometer to sink into the paint under its own weight, making sure that it floats free of the bottom of the container. Remove the hydrometer and note the reading on its stem at the point to which it sank in the material. This reading multiplied by 8.33 is the weight per gallon in pounds.

The weight per gallon may also be obtained by directly weighing a definite volume of the paint. Carefully weigh a clean, dry thirty-two fluid ounce graduate. Fill it to its topmost graduation with the well stirred material which has been brought to seventy degrees Fahrenheit. Weigh the filled graduate. The difference in weights multiplied by four is the weight per gallon in pounds.

primer-surfacer that will embody all the fine properties required is necessary to the final results.

To begin with, color is the first requisite to the lightest colored silver job. It has been found that a warm, neutral gray, not too dark, will give the best results. It should dry sand to a smooth surface free from all burning or guttering. A 6-0 paper is coarse enough to give minimum of scratches, then finish off with a 320 or 400 wet or dry paper. Caution: most heavy pigmented undercoats contain a high percentage of carbonate of lead, when dry sanded this will in time be harmful to some individuals, therefore it should be insisted that the lead content be kept low or eliminated altogether. The first coat is sanded within three to four hours. The second coat is allowed to dry over night before sanding.

Testing for checking, adhesion and flexibility is accomplished by means of test panels, the size of which will be governed by the size of the oven or the refrigerator available. These panels are filed for future reference. I believe this angle has been neglected in some finishing departments. Retain a sample of each shipment of material for comparison with new ones, for uniformity.

The following "Cycle" will show up any deficiencies in the undercoater and can also be used for the built up finish to determine the qualities of each material used. Place the properly washed and coated panel in the oven heated to about 120 degrees to 140 degrees Fahrenheit, for at least three hours, then remove and place in the refrigerator for the same period. Most refrigerators will go down to almost freezing. Inspect panel after each cycle for checking or cracking. This cycle can be repeated for 20 to 50 three-hour periods or until any signs of checking appears.

Elasticity can be checked by the knife test for brittleness and loss of adhesion. Another test for adhesion is to feather down a spot of one to two inches in diameter with sandpaper until the metal surface begins to show through, then turn on the air gun, using about 75 pounds of air. Some undercoaters can be blown off the metal panel by this means. Later troubles in warehouse and transit are thus held at a minimum. Aging panels at room temperature will also show quality of adhesion and flexibility.

A good undercoater will contain as much as 55 per cent of solids or nonvolatile. This material will take a reduction of two gallons of lacquer to three gallons of lacquer thinner. All orange peel should be completely sanded out before attempting recoating, otherwise these defects will be visible through the top coats.

The application of bronze lacquer is really the most vital part of the whole system. This must be applied free from any streaks, or floating of the bronze powder to insure good results. Most any good bronze lacquer will suffice, or any good polychrome or metallic which is supplied ready mixed, if the following precautions are adhered to.

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I have found that by reducing bronze lacquer slightly less, reduce air pressure just a trifle, about 40 pounds, and spray at a slightly greater distance from the work will eliminate streaks and prevent floating of the bronze. Apply two double coats; this insures less rubbing through on any slightly higher spots.

For the lightest colored silver jobs, I would always recommend the lacquer being mixed fresh before any work is attempted. Always test a new bronze lacquer for jelling and turning green when admixed with bronze powders by allowing to stand overnight in a covered glass container. A perfect bronze lacquer will not jell or turn green when allowed to stand for 24 to 48 hours after mixing with gold bronzes.

Cheap thinners tend to promote discoloration with good lacquers. Regular bronze lacquers require only thirty minutes drying before applying the top coats. Ready mixed metallics and polychromes usually require longer periods.

The selection of the top coat should be done with paleness of color as all important. Good top lacquers will contain 27 per cent solids and may be reduced about 4 parts lacquer to 1 part thinner. It is advisable to use a little longer thinner to promote best flow. Two double coats are applied, using the utmost caution to eliminate undue orange peel, by using full wet coats. Allow at least three hours in between coats. Allow second coat to dry overnight.

Rub down with pumice and water until all orange peel has been eliminated. Then polish with a good paste polishing compound until all scratches have disappeared, and a full deep lustre is obtained. I have found that regular "outing flannel" which can be purchased in any dry goods store is the finest to use to finish off, and then clean up with a good non-abrasive lacquer liquid polish.

The appearance of this shell will approach that of a solid bronze shell, the depth of film will look a foot deep and have more lustre than a piano finish. Where no rubbing is permitted on the top coats, a free flowing, high gloss, non-polishing lacquer may be used. This is usually supplied ready to spray, contains very high solids and is the closest approach to a rubbed finish on the market. It is very slow drying and cannot be shipped before overnight drying for fear of printing.

I have found that after rubbing out the top coat, much time may be saved if a coat of mist thinner is applied; this will flow out all scratches and save almost a third of the time required to polish. Less than a quart of thinner per shell is applied and this is a lot cheaper than an hour or two of labor.

The ROBERTS WAY

Means faithful finishing performance at right cost, due to high quality, uniformly produced ROUGES and BUFFING COMPOUNDS.

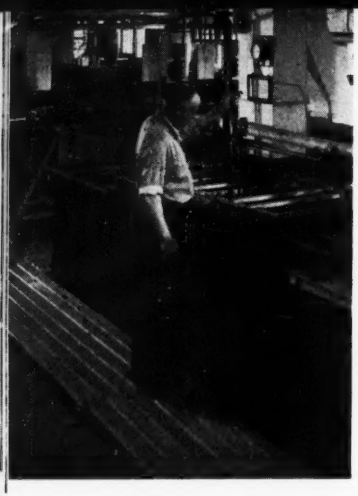
ROBERTS ROUGES and COMPOUNDS are constantly reflected in the superior finishes on many nationally known products.

Please advise type of your base metal or material and finish desired and suitable samples will be sent promptly at no charge.

THE ROBERTS ROUGE CO.

904 Longbrook Ave., Stratford, Conn.

Specialists in manufacturing of gold, sterling, and silver plate rouges; stainless steel, chrome, and crocus compounds.



New PLANT EQUIPMENT AND Materials

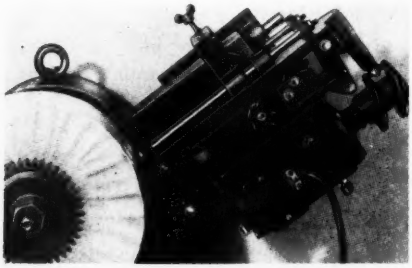
Packer Electric Automatic Composition Applicator

A simple, compact, efficient and self-contained applicator for automatic application of buffing compounds to buffing wheels, to be known as the "Packer Electric Automatic Composition Applicator," has been placed on the market by The Packer Machine Co., Meriden, Conn. This unit operates independent of any external cams, projecting lugs and buffing machine speeds. This unit may simpy be plugged into any 110-volt lighting system for operation. The Packer Electric Automatic Composition Applicator is said to afford a method for smooth, uniform application of composition, automatically applied and controlled.

The capacity of the composition holder is any size up to eight inches wide. The length of the composition material is not limited to the usual commercial sizes. The wheel face and composition material can be the same width.

The motorized automatic composition applicator imparts a smooth, regular rocking motion of the composition cake to the buffing wheel. There is said to be no sliding surfaces to create friction and wear. A provision is made to compensate for wheel wear.

A standard applicator bracket furnished with the Packer-Matic Polishing and Buffing machine is said to permit the setting of the Electric Applicator in any position around the periphery of the wheel.



Packer Electric Automatic Composition Applicator

Sparkler Laboratory Filter

The development of a compact, versatile laboratory filter of the horizontal-plate type has been announced by the Sparkler Manufacturing Company, Chicago, Ill. According to the manufacturer, the filter is extremely flexible, since it can be operated with hydrostatic pressure, air pressure, gas pressure, or by vacuum. It is said to handle viscous materials as well as aqueous solutions in quantities from one pint up with flow rates of from one gallon to 150 gal. per hr. with no unfiltered holdover and no loss of fluid. Every known filter medium, it is claimed, can be used in the unit, including diatomaceous earth of all types, activated carbons, filter papers, filter or wire cloths, asbestos, fuller's earth, and bleaching and absorbent clays.

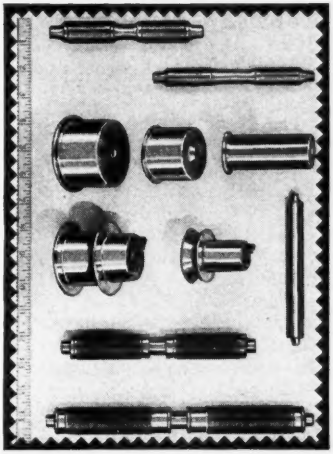
INCREASE PRODUCTION » CUT COSTS »

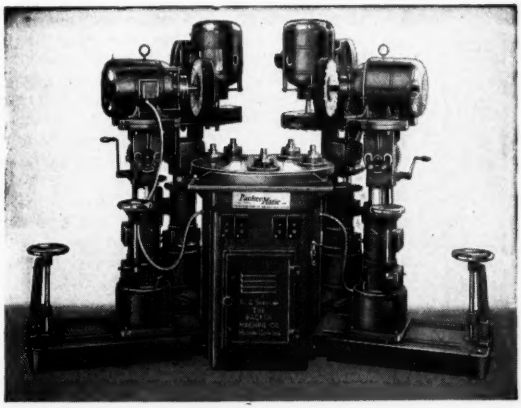
Packer-Matic
Automatic
POLISHING & BUFFING MACHINES

ROTARY TYPE USED

FOR TEXTILE PARTS

Yes, it's a tough job of Finishing yet it is being easily and economically done on Packer-Matic. The Textile Industry steps up Production and cuts Costs on its oddly shaped Parts plus doing a more uniform job of Finishing. Many other Industries are also proving to their satisfaction the definite savings made by the use of Packer-Matic.



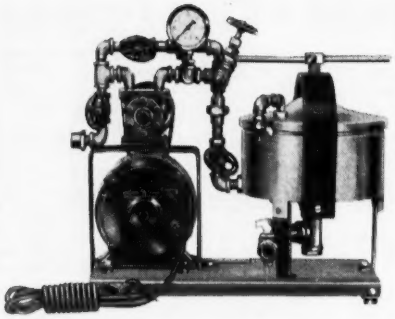


Packer-Matic is made in three types, ROTARY — STRAIGHT LINE CONVEYOR — ROLL. Parts large and small, varied shapes and different metals are efficiently and economically Polished and Buffed on Packer-Matic.

SEND your Part and get a "Time Study" gratis—you, too, will find the report interesting. WRITE "Time Study" Dept.

PIONEER BUILDERS OF AUTOMATIC POLISHING AND BUFFING MACHINES

THE PACKER MACHINE CO. MERIDEN, CONN., U.S.A.



Sparkler Laboratory Filter

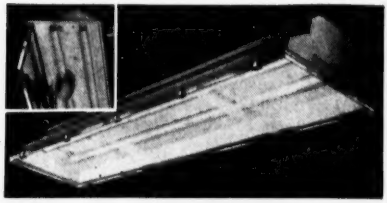
The Sparkler Laboratory Filter consists of three horizontal plates, 8 in. in diameter, mounted in a cylindrical filter tank with a single clamp cover. Equipment is made in iron, aluminum, bronze, monel, and stainless steel. The filtering area is one foot square with a cake displacement of 144 cu. in., and is said to hold two pounds of filter aid. The laboratory filter is equipped with ¼ h.p., 110-volt motor to drive the liquid pump that can be used for transfer purposes, if desired. Other features of the unit are claimed to include ease of cleaning and ready accessibility of all parts.

Prepare Metal For Painting
with
SOL KLEAN
A phosphoric Acid Type of Cleaner
Write for Free Sample
Industrial Chemical Products Co.
CHICAGO DETROIT MILWAUKEE

Sealed-Flo Fluorescent Lighting Units

A sealed cover construction to be known as "Sealed-Flo" has been incorporated in the fluorescent lighting unit now being marketed by Benjamin Electric Mfg. Co., Des Plaines, Ill. This sealed cover construction not only protects the fluorescent lamps and reflecting surfaces from dust and dirt, but also extends the use of fluorescent lighting to locations requiring vapor-proof and dust-tight fixtures, opal glass diffusing fixtures or "unbreakable" glass protection of lamps and reflecting surfaces.

The Benjamin Sealed-Flo Fluorescent Lighting Units can be used in locations where lighting equipment is subject to



Sealed Flo Fluorescent Lighting Units

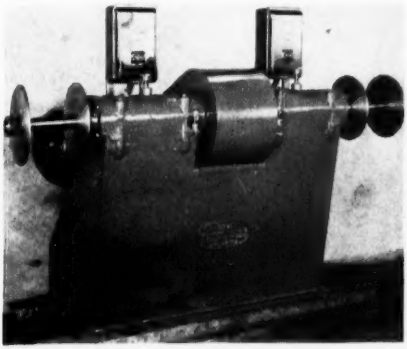
the most adverse atmospheric conditions, such as steam, dampness, noncombustible dusts and vapors. The protective cover with which the one-piece Sealed-Flo units are equipped is specially constructed to provide for easy servicing. The cover is hinged to the lamp housing and locked in place by means of hand operated cover clamps. When opened, the cover hangs straight down for easy servicing.

Benjamin Sealed-Flo units are available in arrangements for either two or three 48-inch fluorescent lamps. The light absorption of the special clear glass cover is said to only slightly affect the rated 78 per cent light output efficiency of the unit.

Every BUFF Made to Your Order
Deliveries on Schedule
MIDWEST BUFFS
USE MIDWEST
E. 79th ST. & PLATT AVE. CLEVELAND OHIO

Rome Model 2HMO Polishing and Buffing Lathe

A heavy duty, two motor, double spindle polishing and buffing lathe designated as the Model "2HMO" has been placed on the market by Rome Machinery Sales & Engineering Co., 627 Webster St., Rome, N. Y. This machine is said to be especially well adapted to the requirements of new slow speed, loose abrasive method of finishing.



Rome Model 2HMO Polishing and Buffing Lathe

The Rome Model 2HMO lathe can be arranged for heavy duty automobile bumper rail polishing and buffing. Long overhanging wheel spindle housings are also available for agricultural implement processing.

The machine shown in the illustration is equipped with two 10 h.p. totally enclosed, fan cooled, ball bearing motors and magnetic starting switches, push button operated. Motors up to 25 h.p. can be accommodated in the assembly of this machine. The spindles will carry 18 in. to 36 in. diameter, 8 in. face wheels with 2 in. arbor holes. Wheel dust hoods of any design can be furnished complete with mounting brackets according to specification.

Chrome-manganese alloy steel wheel spindles, ground to size and balanced, are mounted on multi-sealed ball bearings which are said to have exceptionally high load capacity.

Wayne Spray Booth Cleaners

Spray booth cleaners which were developed to prevent the overspray of paint, lacquers, enamels, and other liquid coatings from becoming bonded to the interior surface of spray booths are now being marketed by the Wayne Chemical Products Co., 9448 Copeland St., Detroit, Michigan.

"No. 5 Spray Coat" spray booth cleaner can be applied to the clean surfaces by spraying and quickly dries to a white, hard coating which is said to be easily removed, together with attached paint overspray, with a stream of water or with steam hose.

"Formula 100" is similar to No. 5 Spray Coat with the exception that it has a grayish color and remains tacky in order to aid in the removal of small air-floating particles of dust, paint, and so on.

"No. 2 White Liquid Spray Coat" forms a chalky coating that can be brushed off in spots and re-coated where necessary.

In addition to the above coatings, the company has developed a heavy, transparent jelly-like compound that may be easily applied to clean surfaces by brushing or swabbing. This compound is designated as "Wayne Spray Booth

Borolon
TRADE MARK
First quality aluminum oxide abrasive grain manufactured in our own electric furnace plant under strictest standards of quality and uniformity. Available in four types (CT, T, B, TB), each of which is most efficient for polishing work within its field of application. Write for Abrasive Grain Data Sheet No. 1 giving complete details. Samples sent of grain sizes you specify.
POLISHING GRAIN

ABRASIVE COMPANY
Division of Simonds Saw and Steel Company
Tacony & Fraley Streets - Philadelphia, Pa.
Chicago Branch: 1624 South Western Ave.

Soap." When booths that have been coated with the compound are ready for cleaning, the surfaces may be scraped off with ease.

Cowles Aluminum Cleaner

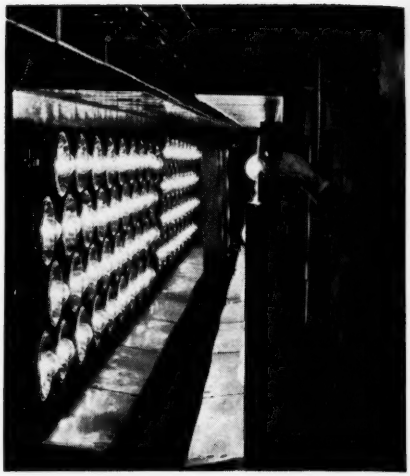
A new aluminum cleaner, Cowles AE, for general cleaning of aluminum parts of all kinds has been added to the well-known line of metal cleaners manufactured by the Cowles Detergent Company, 7016 Euclid Ave., Cleveland, Ohio. This mild alkaline cleaner has been especially designed to prevent corrosion of non-ferrous metals when cleaned. Mirror-finished surfaces of aluminum are not visibly affected by a one-hour exposure to concentrations of this cleaner as high as six ounces per gallon at boiling.

Cowles AE cleaner has been compounded to produce in solution the high collodial activity and proper balance of detergent anions necessary for the efficient and safe cleaning of aluminum parts from accumulations of shop dirt, drawing and cutting oils. It is customarily used in concentrations of three to six ounces per gallon of hot water. The time of immersion and temperature of the solutions are dependent upon the individual cleaning demand. Parts cleaned in Cowles AE rinse freely and after drying are ready for further finishing, assembly, or shipment.

Ault & Wiborg Infra-Red Finishes

A newly developed line of finishes designed especially for use with infra-red baking equipment is announced this month by Ault & Wiborg Corporation. Ault & Wiborg's low-bake finish, Polymerin-100, which is included in this line, has been used extensively for some time with infra-red systems, where it is reported to cure rapidly, providing a hard, flexible and durable film.

Aware of the growing interest in and importance of infra-red baking, Ault & Wiborg engineers have made comprehensive studies on infra-red and infra-red finishing problems. Formulations they have developed include both undercoats — primers and primer surfacers — and topcoats in a full range of plain colors with no limitation as to lustre. A hammered effect and wrinkle finishes are also available. These finishes enable manufacturers to benefit by the time- and space-saving advantages of infra-red applications and yet maintain satisfactory characteristics of hardness, flexibility, durability and adhesion.



Radiant infra-red heat installation at the Steel Storage File Company, Cleveland. Polymerin baking schedule here is under five minutes, with infra-red equipment.

Speed schedules made possible with Polymerin have, in some cases, been reduced even further by utilizing infra-red baking equipment. A storage file, for example, which will ordinarily bake for fifteen minutes at 300 deg. F. with Polymerin is being baked in an infra-red lamp setup in five minutes. The speed-up made possible by specially de-

For a real good polishing job use

KEYSTONE EMERY

TURKISH — NAXOS — AMERICAN

KEYSTONE EMERY MILLS *Write for Sample* **4316 Paul St., Phila, Pa.**

signed A & W finishes used in a large auto plant resulted in a 30 per cent saving in light costs. Polymerin infrared finishes are being used successfully in a variety of industries, it is reported, on household appliances, auto parts, cabinets, enclosures, and many other types of products.

Resistoflex PVA Hose Applied to Fyr-Fyter Fire Extinguishers

According to an announcement made by Resistoflex Corporation, 39 Plansoen St., Belleville, N. J., The Fyr-Fyter Company, Dayton, Ohio, has standarized upon a special type of Resistoflex PVA hose for use on approved type Fyr-Fyter fire extinguishers. The hand fire extinguisher illustrated herewith is a Duplex Pump "Captain" Fyr-Fyter of one-gallon capacity. Pressure for discharging the chemical charge is provided by two air pumps operated tandem.

Duplex Pump "Captain" Fyr-Fyter Equipped with Resistoflex PVA Discharge Hose

The Resistoflex PVA discharge hose replaces the metal-lined and rubber-covered hose formerly used. A specially compounded PVA tube (flexible synthetic resin, basically of Polycinvyl Alcohol composition) is utilized for the construction of the Resistoflex PVA Fire Extinguisher Discharge Hose, which is a special type of Resistoflex Corporation's "Super-Chemical" hose. Since PVA is said to be distinguished by complete inertness to hydrocarbons, the tube, it is claimed, is unaffected by carbon tetrachloride and does not harden, check, or crack due to aging, corona, or other service conditions. The tube is reinforced by a single fabric braid and supplied with an outer covering of synthetic rubber. The synthetic rubber, while not inert to carbon tetrachloride, with which it does not come in contact, is said to be highly resistant to aging, oxidization, sunlight, and corona, and therefore provides the hose with a strong abrasion-resistant cover.

According to the manufacturer, Resistoflex PVA Fire Extinguisher Discharge Hose remains entirely flexible under all atmospheric conditions and temperatures. It is extremely flexible and is said to withstand flexing almost indefinitely.

Triflex "K" Rubber Tank Lining

A rubber tank lining material to be known as Triflex "K" has been developed for bright nickel plating and for high speed bright copper solutions by The B. F. Goodrich Company, Akron, Ohio. Triflex "K" is a special adaptation of a patented three-ply lining construction developed by the Goodrich company in response to demands for a durable lining for heavy duty pickling tanks in the steel industry.

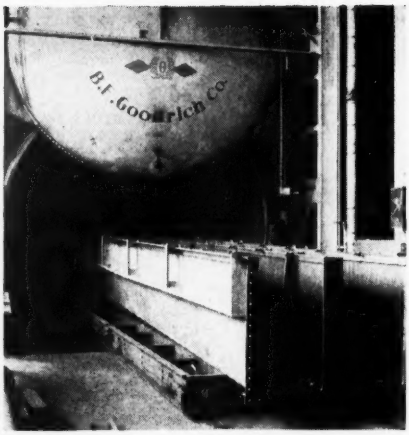
Certain tank linings have a tendency to throw the delicate baths used in high speed copper plating off balance, causing them to plate with a non-adherent

THE ADIRONDACKS GORE MOUNTAIN CRYSTAL GARNET ORE

ABRASIVE GARNET

World's Standard for Over 60 Years
FOR
Abrasive Paper and Cloth
Grinding Wheels
Sand Blast
Lithographing
Non-Skid Surfaces
Wearing Surfaces
Ornamental Purposes
Minus 300 Mesh For Polishing

BARTON MINES CORPORATION
NORTH CREEK, WARREN COUNTY, N.Y.



Section of a Triflex "K" rubber-lined steel tank for automatic electroplating installation.

deposit. Triflex "K" lining is said to be non-contaminating and completely resistant to the corrosive effects of copper plating solutions. Triflex comprises a layer of hard rubber construction between two layers of softer rubber, the three plies being vulcanized together to form an integral structure. Adjacent sheets of the three-ply material are overlapped to form expansion joints in which the hard rubber layers are separated.

This construction is said to permit tanks to be operated with wide variations in temperature without damage to the lining by expansion or contraction.

Improved Black Finish on Steel

According to Hanson-Van Winkle-Munning Company, Matawan, N. J., an improvement has recently been developed in the Jetal process for applying a black, corrosion and rust resistant finish to steel. The process has been changed to a two-bath system which yields a deep black coating and at the same time, simpler manipulation and control of the solution.

Two tanks of ordinary iron or steel are required for Jetalizing. (No brass or copper fittings should be used.) The first, or "A" tank, should be kept at 280 deg. to 290 deg. F., and the second, at 305 deg. to 315 deg. F.

Three water rinsing operations are involved, which may be carried out in one or more steel tanks. The water containing the drag-out should be used to replace evaporation losses from both Jetal tanks, but the iron in this drag-out water must be removed before it is returned to the system, either by filtration or by allowing the iron precipitate to settle and siphoning off the clear water. It is customary to use a final hot rinse to speed up the drying operation, but drying in warm air is also practicable.

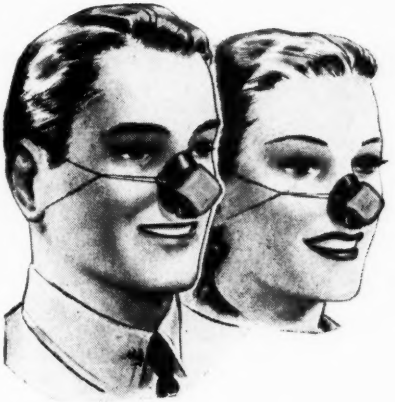
All steels, except those high in nickel or chromium, can be colored black by the Jetal process. (Cast iron and some special steels may require deviations from the routine process.) The first step is to remove excess grease or oil from the work in a suitable cleaning solution. Then, dip the work in the alkaline rinse water containing the drag-out. In many cases, such as with hardened steel surfaces, it is advisable to give the cleaned work a short dip in cold dilute acid to secure a deeper black in a shorter time. Heavy scale or rust should be removed in a pickle. The acid dip must be followed with a water rinse before placing the work in the drag-out rinse. From the drag-out rinse, the wet work is placed immediately in the Jetal "A" tank and kept there until some coloration is noted. The work is then removed, rinsed in cold water and immediately placed in the Jetal "B" solution where it remains until the desired depth of black is obtained. This operation is followed by a rinse in the cold drag-out tank, and then with another cold rinse, and finally the hot rinse, to remove the final traces of the Jetal solution. The last rinse may be in hot water alone or in hot water containing six per cent or more of a suitable soluble oil in order to obtain dry finished work of excellent appearance.

RUST-I-CIDE "50"
Cleans, etches, and prepares metal for a perfect finishing job.
It can help your product.
RUSTICIDE PRODUCTS CO.
3125 Perkins Ave. • Cleveland, Ohio

The time required for the Jetal dips varies with the class of work, but in general, ranges from about two minutes to five minutes in each tank.

Dupor No. 1 Respirator

A respirator so small that it will rest in the palm of the hand and can be carried in the vest pocket has been placed



Dupor No. 1 Respirator

on the market by H. S. Cover, South Bend, Ind. Built along lines of stratosphere oxygen apparatus that covers the nose only, this unusual style respirator is said to represent a new era in respirator design. It is said to be an ideal protection against nuisance dusts and can be slipped on or off as readily as a pair of spectacles. The workmen equipped with a Dupor No. 1 Respirator can talk, eat, smoke, and so on, without removing the respirator.

The nose piece is of soft, pliable rubber that makes an air-tight fit over any shape nose. The filter, which is about the size of a small wafer, is folded in such a manner that nine square inches of filtration area is provided. The filter can easily be changed when desired. An inhalation valve keeps the wearer from re-breathing air without allowing unfiltered air to enter. The only requirement is that the wearer breathe naturally through the nose as nature intended. Handy elastic loops slip around the ears to hold the Dupor No. 1 Respirator in position.

The respirator is so small that it will not obstruct or interfere with goggles and glasses. No metal is used in the construction.

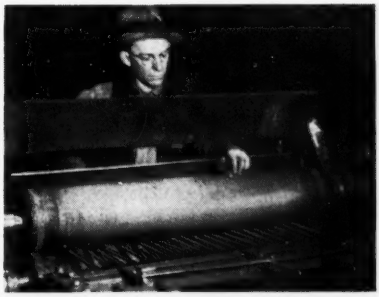
Ballou Imitation Chrome Finish

An imitation chrome finish in paste form which is said to produce a beautiful imitation of a real plated finish has been placed on the market by Edward C. Ballou Company, 6 Varick St., New York, N. Y. The material is available in paste form and can be used with quick bake synthetics or varnish type vehicles. The material can also be mixed with lacquers.

M. S. A. All-Service Mask

Mine Safety Appliances Company, Braddock, Thomas and Meade Sts., Pittsburgh, Pa., has announced the addition of an all-vision facepiece to the M. S. A. All-Service Gas Mask. The new all-vision facepiece features non-

"Machine-Glazing" KNIVES
with
"Indian Brand" 4F Turkish Emery



(Photo Courtesy of W. R. Case & Sons Cutlery Co.)

24 blades are polished at once with 4F Turkish Emery at the W. R. Case & Sons Cutlery Company, Bradford, Pa.
Absolute uniformity, longer wear and prompt delivery. Write for *your* trial lot today.

HAMILTON Emery & Corundum Co.
CHESTER • MASS.

fogging, large-area lenses of laminated shatterproof glass. Maximum useful vision is permitted at all seeing angles, with lenses contoured at sides. Dry in-

M. S. A. All-Service Gas Masks can be used by workmen in chemical plants

coming air is conducted over the lenses, thus preventing accumulation of moisture or fog. The unit readily fits any face with a gas-tight seal, thus eliminating pressure points, and minimum dead air space inside the facepiece cuts down rebreathing of exhaled air. The specially-compounded, molded rubber facepiece can be sterilized at will, without harm, and will give lengthy service life.

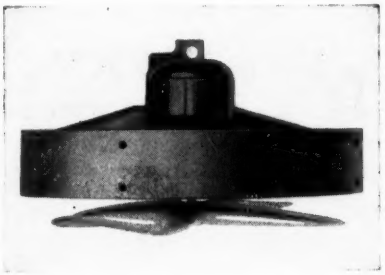
Other popular features of the mask are retained. The well-known all-service canister is specially designed to assure easy breathing and maximum efficiency of the contents. It is provided with chemicals for absorbing or rendering harmless all poisonous industrial gases, smoke and vapors — including carbon monoxide. A corrugated non-collapsible tube connects the facepiece to the canister. The tube, made to withstand the hardest service, is light and flexible, permitting free hand movement.

An all-rubber head harness holds the facepiece so that no metal touches the face. A strong, durable harness straps the canister to worker, leaving hands free at all times. Prominent among the exclusive features on the mask is the timer, an extremely simple and positive device that indicates the service time undergone by the canister—eliminating all guesswork regarding its condition.

Truflo Roof Ventilating Fan

A line of roof ventilating fans has been placed on the market by the Truflo Fan Company, 579 Main St., Harmony, Pa. These fans are recommended where it is necessary to increase air removal in gravity-type ventilators, or when wind-mile velocity is not sufficient to ventilate the building.

Truflo Roof Ventilating Fans are available in 48 in., 42 in., 36 in., 30 in.,



Truflo Roof Ventilating Fan

24 in., and 18 in. sizes with air exhaust capacities ranging from 40,000 to 2,000 cu. ft. per minute. They are mounted in steel bands as illustrated. Propellers are made of high quality cast aluminum alloy. Motors can be had in open, to-

GALVAPREP

FOR ZINC and ZINC-COATED METALS

Galvaprep cleans and provides a hard paint receptive surface; removes and neutralizes harmful agents and provides an ideal toothed base for paint. Economical and simple to use.

Write for Galvaprep folder.

NEILSON CHEMICAL CO.

6564 Benson St. Detroit, Mich.

1852 E. Slauson St. Los Angeles, Calif.

tally enclosed non-fan cooled, totally enclosed fan cooled, and explosion proof types. Inside diameter of ventilating stack and amount of air to be delivered determine the proper size.

American Cyclone Dust Collector

A cyclone dust collector of the type generally known as the high efficiency, long cone cyclone has been placed on the market by American Foundry Equipment Company, 580 S. Byrkit St., Mishawaka, Ind. In operation, the dust is separated from the air stream by centrifugal force. The American Cyclone Dust Collector is available in various sizes to meet specific requirements.

American Cyclone Dust Collector

Dust hoppers and supports vary according to the particular installation and may be supplied by the customer according to the company's specifications. The dust hopper of the unit, or storage tanks, can be of any design, providing they will efficiently handle the capacities of dust to be controlled.

The collectors are constructed of heavy gauge metal to withstand the scouring action of the dust being collected.

H-V W-M Hose Type Insulating Steam Joint

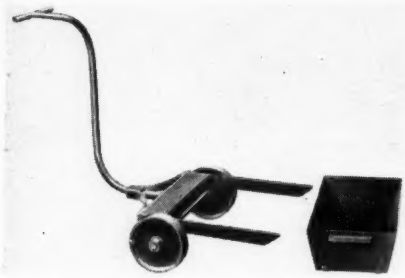
A new type of insulating steam joint has been developed by the Hanson-Van Winkle-Munning Company, Matawan, N. J., manufacturers of electroplating equipment and supplies. This joint, called the "Hose Type," consists of a special seamless rubber tube, compounded to resist steam and heat and covered with plies of strong, closely woven duck. Between these plies are placed layers of insulating rubber. A heavy gauge cover is applied on the outside.

H-V W-M Hose Type Insulating Steam Joint

Each joint is eight inches long and built to stand 100 pounds steam pressure. It is furnished complete with hose clamp on each end for attaching to standard size iron pipe. The joints are inexpensive, easily attached and replaced, and fully adequate for all of the normal conditions of acid and other chemical handling equipment.

Barrett-Cravens Tote Box Truck

The Barrett-Cravens Tote Box Truck



Barrett-Cravens Tote Box Truck

illustrated herewith, product of the Barrett-Cravens Co., 3250 W. 30th St., Chicago, Ill., is said to provide a safe, quick, and simple means for moving parts from machine to machine in the shop or to and from stock room or storage. Of rugged all-welded steel construction throughout, the truck is sufficiently strong to support any weight of material that can be carried in a tote box 22 in. long x 11 in. wide. In some cases, tote boxes can be tiered as many as three high for movement at one time.

The arms or prongs on the Barrett-Cravens Tote Box Truck are spaced so as to engage the handles on a standard tote box. After the prongs have been made to straddle a tote box, a slight pressure on the handle lifts the tote box off the door so that it can be trucked to any location. Two wheel suspension provides flexibility that permits tote boxes to be maneuvered into close quarters, between machines, and so on. Special dimensioned trucks are available for tote boxes of a size other than 22 x 11 in. and for unusual shapes.

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ALBERT PICK HOTELS
21 FLOORS OF OUTSIDE ROOMS
EACH WITH COMBINATION TUB & SHOWER
FROM $2 DAILY SINGLE
CADILLAC SQUARE AT BATES ST.
DETROIT

Maas & Waldstein Codur Stove Enamels

A line of enamels especially adapted for use on stoves to be known as M & W Codur Stove Enamels has been placed on the market by Maas & Waldstein Company, 438 Riverside Ave., Newark, New Jersey.

M & W Codur Stove Enamels are supplied in white, porcelain white, and colors. A single coat of this type of enamel baked from 5 to 45 minutes, depending upon the temperature and type of oven, is said to produce a fine glossy finish that is resistant to marring, hot grease, and kerosene and will withstand heating to 420 deg. F. for eight hours without noticeable discoloration.

For more severe service, a special high-heat gloss enamel is supplied, which will withstand 425 deg. F. for 12 hours without objectionable discoloration.

An attractive and durable finish for heaters and other types of stoves consists of a coat of M & W Duart wrinkle enamel followed by a coat of Metalustre of any desired color. This type of finish will withstand 420 deg. F. for 150 hours without darkening. A single coat of pigmented Duart wrinkle enamel is also used by some stove manufacturers.

Saty-Nite

A porcelain finish for hot water tanks to be known as "Saty-Nite" has been developed by The Porcelain Enamel & Manufacturing Company, Eastern and Pemco Avenues, Baltimore, Md. This finish is said to have attractive possibilities, both to the manufacturer of domestic hot water heaters and to the property owner in areas where city water is of high corrosive content.

Opportunity Section

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400/200 amp. 6/12 volt H. & V. W.
300 amp. 3 volt Elec. Prod. vertical motor drive.
200 amp. 7½ volt Hobart, motor drive.
200 amp. 6 volt Electric Products, motor drive.
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Bristol Recording Voltmeters and Ammeters. Modern round-chart recording voltmeters and ammeters, together with some of their applications, are described in a bulletin which is now being issued by The Bristol Company, Waterbury, Connecticut.

The bulletin is liberally illustrated to show the various models available for wall and flush pane mounting and for portable use. Detailed drilling dimensions, as well as a list of chart ranges, are also given.

Copy of this bulletin will be sent free upon request.

FOR YOUR Catalog LIBRARY

To obtain copies of the catalogs listed here, indicate on the coupon the number of the item in which you are interested and mail as directed.

1. Ferrisul
A 12-page catalog describing in detail the use of Ferrisul (anhydrous ferric sulfate) for etching steel and for pickling stainless steel, copper and copper alloys is now being issued by Monsanto Chemical Company, Merrimac Division, Everett Station, Boston, Massachusetts.

2. American Combination Wheelabrator Tumblast-Tablast
A combination wheelabrator cleaning unit consisting of tumblast and tablast action is described in a folder now being issued by The American Foundry Equipment Co., 555 S. Byrkit St., Mishawaka, Indiana.

3. Chemical Resisting Equipment
Chemical resisting equipment for electroplating and metal pickling process is described in a folder which is now being issued by Heil and Company, 3088 W. 106th St., Cleveland, Ohio.

4. Wind-O-Fan, Jr.
A fan for providing cool comfort in factory offices, laboratories, and so on, is described in a folder now being issued by the Chelsea Fan & Blower Co., Inc., 370 W. 15th St., New York, New York.

5. GKS Cabinet Ovens
Completely automatic, recirculating type, electrically heated, standard size ovens are described in this catalog which is now being issued by George Koch Sons, Inc., 2112 Pennsylvania St., Evansville, Indiana.

6. Baker Guide to Successful Plating with Gold
A 12-page catalog describing gold plating methods and processes and including formulas is now being issued by Baker & Co., Inc., 113 Astor St., Newark, New Jersey.

7. Chrome Aluminum Color Card
A color card describing material for obtaining a beautiful imitation of a real chrome finish is now being issued by Edward C. Ballou Company, 6 Varick St., New York, New York.

8. Hellige pH Instruments
A catalog designated as the "No. 602," describing and illustrating Hellige pH apparatus, is now being issued by Hellige, Inc., 3718 Northern Blvd., Long Island City, New York.

9. Easy Electric Sander
The all-electric portable finishing machine for easy finishing application known as the "Easy" Electric Sander is described in a catalog now being issued by Detroit Surfacing Machine Company, 7433 W. Davison Ave., Detroit, Michigan.

10. Dust Control
A complete story of dust control in words and pictures by means of Roto-Clone dust control equipment is now being issued by American Air Filter Company, Inc., 700 Central Ave., Louisville, Ky.

11. Drying Problems Made Easy
The manner in which Nalco Dritherm infra-red ray carbon lamps make drying problems easy with radiant energy is described in an eight-page catalog which is now being issued by North American Electric Lamp Company, 1014 Tyler St., St. Louis, Missouri.

12. Weka Grinding and Polishing Wheels
A six-page folder describing and illustrating Weka grinding and polishing wheels is now being issued by Atlantic Weka Corp., 35 Wooster St., New York City.

13. Paper Masking Tape
A masking tape that is highly resistant to lacquers, paints, and solvents is described in this folder now being issued by Industrial Tape Corporation, New Brunswick, New Jersey.

14. Metalprep
A preparation which is said to remove rust, clean metal, destroy rusting agents, assure a bond between paint and metal is described in this folder now being issued by Neilson Chemical Co., 6564 Benson St., Detroit, Michigan.

15. A C P Rust-Proofer
A method for obtaining paint protection by means of a liquid chemical treatment designated as A C P Rust-Proofer is described in a folder which is now being issued by American Chemical Paint Company, Dept. 303, Ambler, Pa.

16. Airway Ventilated Buffs
Cool cutting buffs for high speed buffing operations are illustrated and described in a 4-page folder now being distributed by Jackson Buff Corporation, 21-03 41st Ave., Long Island City, New York.

17. Pentrate As a Permanent Product Finish
An attractive four-page catalog describing the Pentrate process of metal-finishing is now being issued by Heatbath Corporation, 242 Westfield Ave., Springfield, Massachusetts.

18. Metal Cleaning Tips
The chemical classification and selection of alkaline metal cleaners is contained in a bulletin which has been prepared and is now being distributed by the Cowles Detergent Company, 10525 Carnegie Ave., Cleveland, Ohio.

19. Analysis of Plating Solutions
The fifth edition of this booklet describing simple methods of analyzing plating solutions is now being issued by Hanson-Van Winkle - Munning Co., Matawan, New Jersey.

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